'Feasibility and Acceptability Study of Implementing Birth Preparedness and Complication Readiness Plan through ASHAs – A Health System Research'

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For the award of the degree of Doctor of Philosophy
In the Faculty of Medicine

By

Dr. Annapurna Kari
(Registration No: KLEU/Ph.D/17-18/D01217002)

Under the Guidance of

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2024

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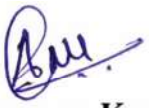

Dr. Annapurna Kari

ABSTRACT

Background: According to WHO, approximately 300 million women in developing regions experience various health issues due to pregnancy and child birth. To address this concern, WHO recognizes BPCR as a crucial component of the ANC package ASHA workers assume a pivotal role in providing healthcare support to expectant mothers within their local communities.

Objectives: To assess the feasibility and acceptability of BPCR plan by ASHAs and to evaluate effect of BPCR training of ASHAs on knowledge & practice of BPCR among recently delivered mothers.

Methods: A quasi-Experimental Pre-Post design was applied in rural region of Belagavi Taluka. All ASHAs of selected CHC and PHCs were included in the study. Recently delivered mothers under the catchment area of ASHAs were included. Ethical approval and written informed consent were obtained. Baseline (Pre-test) data was collected from ASHAs and mothers through interview using a standard tool by JHPIEGO to evaluate baseline knowledge and practice of BPCR. Intensive and meticulous training was provided to ASHAs using a Birth Planner regarding knowledge and practice of BPCR. ASHAs trained pregnant women in their catchment area. Endline data was collected from both ASHAs and mothers. Data was analyzed using SPSS version 22. Descriptive and inferential statistics were employed.

Results: Pre-test mean knowledge scores of pregnancy, labor and childbirth, postpartum danger signs were 31.55%, 27.11%, 27.27% respectively which increased significantly to 73.45%, 53.22%, 59.27% after intervention among ASHAs. Pre-test birth preparedness knowledge and practice were 44.50% and 46.12% which increased to 87.88% and 99.18% post-test. ASHAs felt motivated because of their dignity and

respect in the community. The main barriers for their performance were irregular and insufficient incentives and insufficient healthcare facilities. ASHAs accepted the BPCR planner and it was feasible for them to implement it among pregnant women.

Baseline knowledge scores of pregnancy, labor and childbirth, postpartum danger signs were 5.95%, 4.78%, 4.23% respectively among the mothers who were not trained, but knowledge scores increased to 26.36%, 17.81%, 16.87% respectively among trained mothers. Baseline birth preparedness knowledge and practice in mothers were 28.94%, 35.28% respectively; endline scores among trained mothers were 68.31% and 63.41%.

Conclusion: Study findings showed low levels of knowledge and practice of BPCR among ASHAs and mothers. Findings emphasized the significance of implementing intense training and health education interventions for ASHAs and pregnant women to improve BPCR. Policymakers and healthcare providers should consider incorporating such interventions to achieve SDGs.

Key Words: Birth Preparedness and Complication Readiness, ASHA, Recently Delivered Mothers, Danger Signs, Feasibility, Acceptability

LIST OF ABBREVIATIONS

ANC	Ante Natal Care
ANM	Auxiliary Nurse Midwife
APL	Above Poverty Line
ASHA	Accredited Social Health Activist
AWW	Anganwadi Worker
BP	Birth Preparedness
BPL	Below Poverty Line
CHC	Community Health Centre
CR	Complication Readiness
CHW	Community Health Worker
DH	District Hospital
EDD	Expected date of delivery
EmOC	Emergency Obstetric care
GoI	Government of India
IFA	Iron Folic Acid
IMR	Infant Mortality Rate
JSY	Janani Suraksha Yojana
JHPIEGO	John Hopkins Program for International Education in Gynaecology and Obstetrics
LBW	Low Birth Weight
MCH	Maternal and Child Health
MDG	Millennium Development Goal
MMR	Maternal Mortality Ratio
MO	Medical Officer

NFHS	National Family Health Survey
NRHM	National Rural Health Mission
OPD	Out Patient Department
PHC	Primary Health Centre
PNC	Post Natal Care
PPH	Post-Partum Haemorrhage
PPP	Public Private Partnership
P Value	Probability Value
ROC	Receivers Operating Characteristic Curve
RR	Relative Risk
RTI	Respiratory Tract Infections
SBA	Skilled Birth Attendant
SB	Still Birth
SD	Standard Deviation
SC	Sub Centre
SPSS	Statistical Package for Social Sciences
TBA	Traditional Birth Attendant
TT	Tetanus Toxoid
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
VHND	Village Health and Nutrition Day
VHSC	Village Health and Sanitation Committee
WHO	World Health Organization

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INTRODUCTION

Maternal mortality poses a significant challenge in developing countries, with WHO approximating that 300 million women in these regions experience both short-term and long-term health issues as a result of pregnancy and childbirth.[1]

Maternal mortality continues to be a significant concern worldwide. In 2015, there were 303,000 maternal fatalities globally, leading to a MMR of 216 deaths per 100,000 live births.[1] Millennium Development Goals (MDG) had aimed to attain a MMR of 109/100,000 live births by 2015 but failed to achieve the target. Now India aims to achieve an MMR lower than 70 as part of its Sustainable Development Goal (SDG) by the year 2030.[2]

Between 1990 and 2020, India has made significant progress in reducing maternal mortality rate from 556/100,000 to 97/100,000 live births and neonatal mortality rate from 52/1000 to 28/1000 live births in 2020.[3,4]

India faces significant public-health challenges due to high rates of perinatal deaths, neonatal deaths, and maternal deaths. Approximately 33% of neonatal deaths occur within 24 hours of life, while most maternal deaths and health issues arise during labor, delivery, and the immediate 24 hours after childbirth.[5]

Unforeseen and unpredictable complications such as abortion, preeclampsia, eclampsia, ruptured uterus, puerperal sepsis, and postpartum hemorrhage can lead to maternal mortality, morbidity, and perinatal death. These complications can emerge abruptly, carrying severe consequences. [6]

Interrelated sociocultural factors that cause delays in seeking care and contribute to fatalities are delay in – timely identification of the complications, making the decision to seek healthcare, recognizing and arriving to the healthcare facility, and finally obtaining suitable and sufficient treatment there.[6]

Birth Preparedness & Complication Readiness (BPCR):

WHO has included BPCR which is an important intervention in ANC package as an essential element. This program approach helps to improve the effectiveness and utilization of maternal and child health services. BPCR operates under the notion that adequate birth preparation and readiness for complications can effectively minimize three delays.[7]

The concept of BPCR includes identification of – a skilled birth attendant (SBA) for delivery, a health facility for delivery/emergency/referral, arrangement of transportation, saving funds for delivery/emergency/transportation, a birth companion and a compatible blood donor for emergency.[6]

WHO suggests the adoption of BPCR interventions to promote the utilization of skilled-care during childbirth and ensure immediate healthcare services for pregnancy and newborn-related issues. The components of BPCR are now integrated into the new WHO antenatal care model for clinical settings. Due to the limited and weak quality of evidence from previous BPCR interventions, World Health Organization strongly advocates for additional BPCR interventions and research to be conducted. [8]

Various strategies are employed in BPCR programs, such as house visits conducted by volunteers, health worker training in facilities, distribution of educational materials and visual aids, community mobilization activities, and mass media campaigns promoting BPCR messages.[9]

The effectiveness of interventions is constrained by several factors, including barriers within the health system such as insufficient healthcare professionals, limited resources, inadequate quality of care and high costs associated with health care.[10]

WHO has developed BPCR as an initiative aimed at birth planning and handling potential emergencies throughout pregnancy, labor, and postpartum phase. BPCR focuses on addressing three specific delays and empowers expectant mothers, families, and communities to take prompt and appropriate actions.[11]

BPCR encompasses essential components such as early pregnancy registration and awareness of warning signs throughout pregnancy, delivery, and postpartum phase.[11] BPCR approach entails mobilizing the community, involving stakeholders like CHWs, and promoting active engagement in women's groups to enhance its impact.[12]

Since the inception of ASHA workers as an essential part of NRHM in 2005, there has been noticeable enhancement in the uptake of health services at grassroot levels in India.[13] ASHA, an acronym for "Hope" is a woman volunteer chosen by community and residing in same village, trained to offer healthcare services. [14] ASHA is tasked with raising awareness about facility-based delivery, identifying complications during pregnancy, delivery, and postpartum phase, mobilizing the community to utilize existing health services more effectively.[15]

REVIEW OF LITERATURE

The literature review was aimed at identifying the studies on ASHA workers which impacted on birth preparedness and complication readiness and improvement of maternal and child health outcomes.

Extensive research was conducted across various data sources, including Google, PubMed, Google Scholar, along with consulting reports and documents from international agencies, Indian government, Karnataka government, relevant books and various theses.

Birth Preparedness and Complication Readiness (BPCR):

BPCR is an approach that encourages the timely utilization of skilled maternal and neonatal care, particularly during delivery. The underlying concept is that proactive preparation for childbirth and readiness to handle any complications can help minimize delays in obtaining essential care.[7]

BPCR is a widely utilized strategy in safe motherhood programs. Common components of BPCR involve awareness of danger signs, selecting a birth location and healthcare provider, knowing the nearest skilled provider's location, acquiring necessary safe birth supplies, and designating a companion for the woman. Additionally, it includes organizing transportation, finances, and potential blood donors. The focus is on the "demand side" which pertains to the individual, family, community, or users of healthcare services.

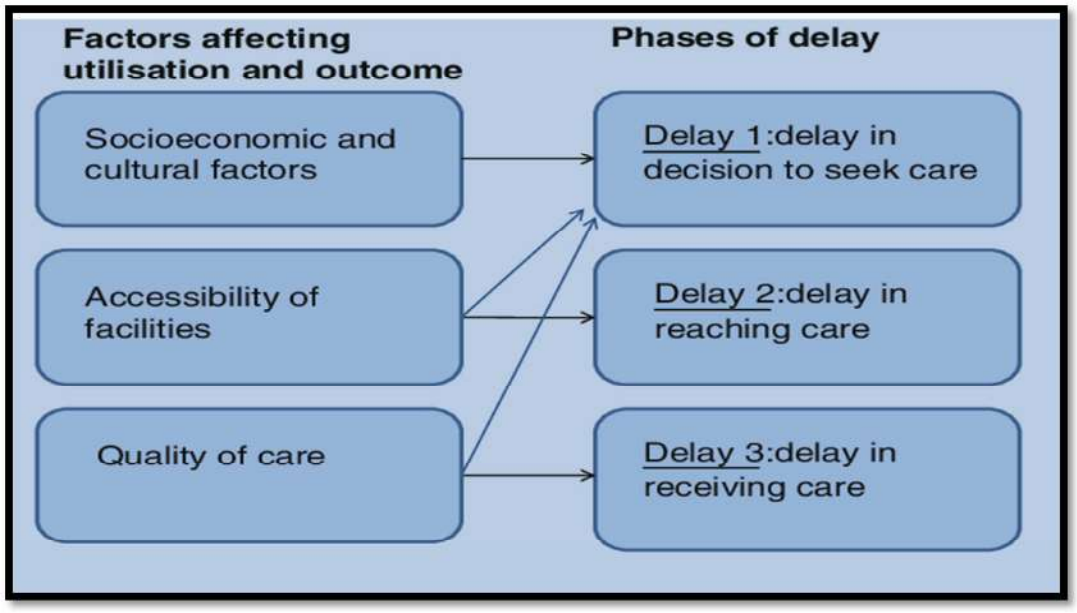
Maternal and Neonatal Health (MNH) Program has broadened the scope of BPCR to encompass the "supply side" of the equation, which includes healthcare provider, facility, and policymakers. By integrating these extra tiers, the program acknowledges that delays in seeking care for obstetric emergencies can arise from

diverse origins, prompting the need for involvement and intervention from various stakeholders across different societal levels.[7]

Conceptual Frameworks:

JHIPEGO has developed conceptual frameworks to visualize levels of BPCR, pathways to through which CHWs can reduce 3 delays effectively using BPCR and bring about favorable maternal outcomes. CHWs are expected to influence BPCR at individual, family and community level by providing health education regarding danger signs, creating awareness regarding how to be well prepared for birth

Figure No – 1. Conceptual Framework of 3 Delay Model[7]



In the context of public health and maternal care, the term "3 Delays" refers to a conceptual framework used to understand and address the barriers that may prevent pregnant women from accessing timely and appropriate medical care during childbirth. These delays are crucial factors in assessing and improving the quality of Basic Emergency Obstetric and Newborn Care (BEmONC) services. The three delays are:

1. Delay in Deciding to Seek Care: This first delay refers to the time it takes for a pregnant woman, her family, or her community to recognize the presence of a complication during pregnancy or childbirth and decide to seek medical assistance. Several factors can contribute to this delay, including lack of awareness about potential risks, cultural beliefs and practices, fear of healthcare facilities, and financial constraints.

2. Delay in Identifying and Reaching Health Care: The second delay refers to the time it takes for the pregnant woman and her family to reach a healthcare facility after the decision to seek care has been made. This delay can be influenced by geographical barriers, inadequate transportation, and poor road infrastructure, especially in rural and remote areas.

3. Delay in Receiving Appropriate Care: The third delay occurs when there are challenges in receiving timely and appropriate medical care at the healthcare facility. This could be due to a lack of skilled healthcare providers, insufficient medical supplies and equipment, and inadequate referral systems to higher-level facilities in case of complications beyond the facility's capacity.

Addressing the 3 Delays is essential for reducing maternal and neonatal mortality and morbidity. To overcome these delays, effective strategies may include community education and awareness campaigns, improving transportation facilities, ensuring the availability of skilled birth attendants and essential medical supplies, and strengthening the referral system between primary and higher-level healthcare facilities.

Figure No – 2. Conceptual Framework of how BPCR may Increase the Use of Skilled Care[7]

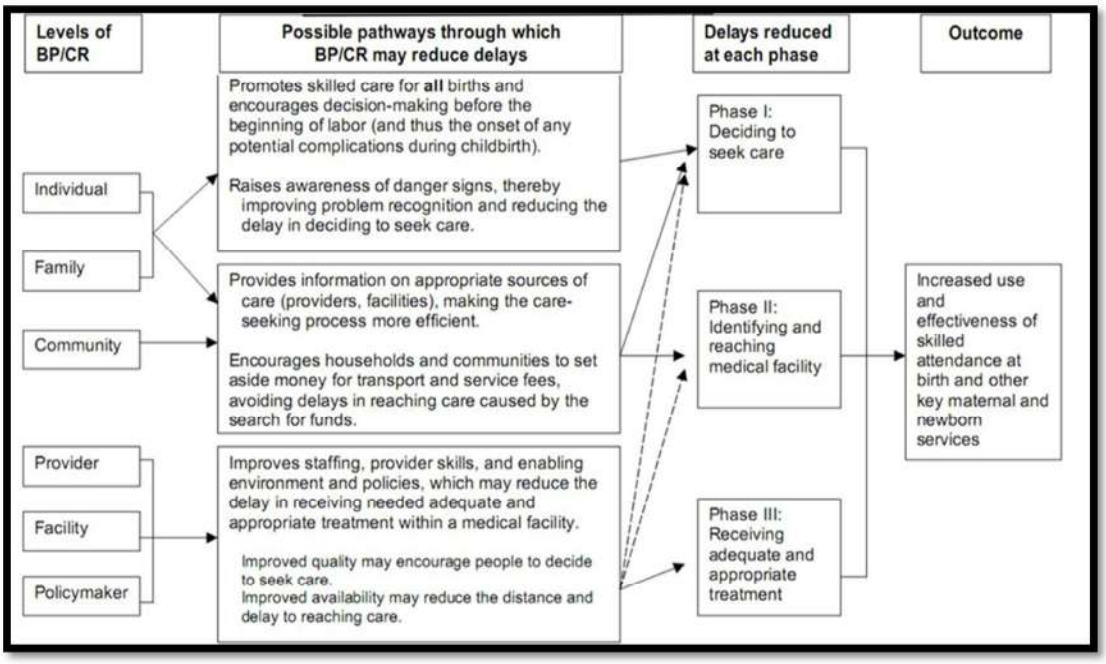
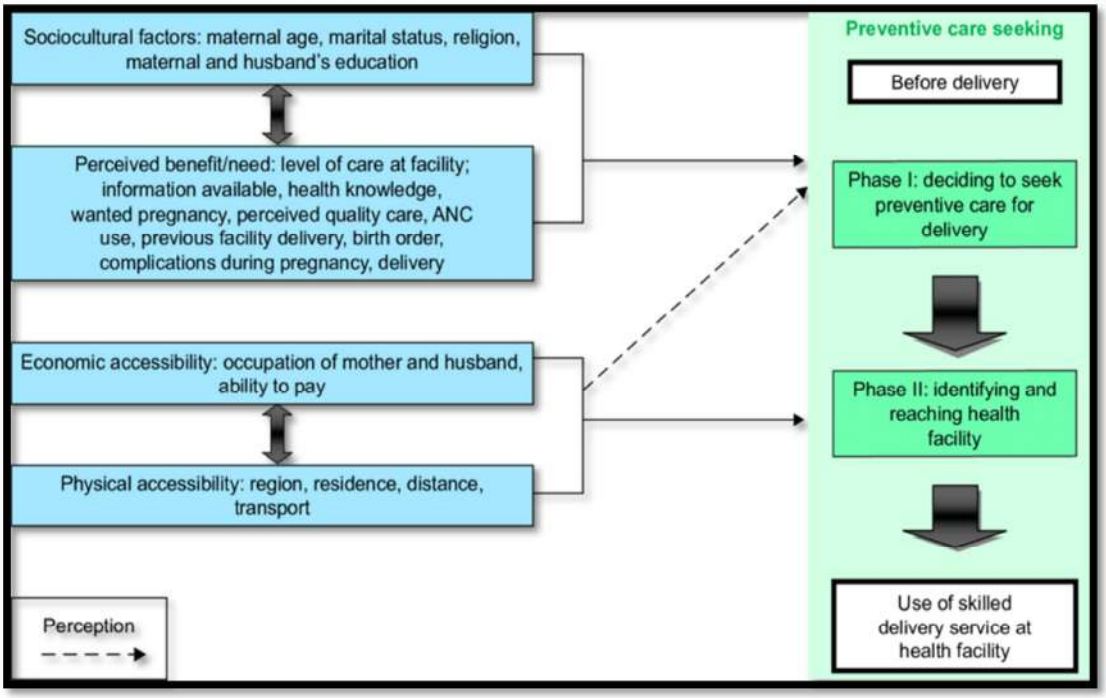


Figure No – 3. Conceptual Framework of Key Components of BPCR[7]



The conceptual framework devised by JHPIEGO serves as a valuable tool for visualizing the different levels and pathways through which ASHA can potentially impact maternal outcomes.

The conceptual framework illustrates how BPCR can enhance the utilization of skilled care during pregnancy, childbirth, and the postnatal period is based on the premise that proactive and comprehensive planning by pregnant women and their families can lead to improved maternal and newborn health outcomes. BP/CR is a strategy commonly used in maternal and child health programs to empower women and their communities to take a more active role in ensuring safe childbirth and timely access to skilled healthcare providers when needed. The framework outlines the key components and pathways through which BP/CR can influence skilled care utilization:

1. Knowledge and Awareness: At the core of the framework is the acquisition of knowledge and awareness among pregnant women and their families about the importance of skilled care during childbirth. Through education and information dissemination, women and their families become aware of potential risks during pregnancy and childbirth and the benefits of skilled care in preventing and managing complications.

2. Birth Preparedness: BP involves making plans and arrangements for a safe and clean childbirth. This includes identifying a skilled birth attendant (SBA), selecting a health facility for delivery, and arranging transportation to reach the facility in a timely manner. By being prepared in advance, women are more likely to seek skilled care when labor begins, instead of delaying or resorting to traditional birth attendants or home deliveries.

3. Complication Readiness: CR focuses on recognizing signs of potential complications during pregnancy and labor, as well as understanding the appropriate actions to take when complications arise. Women and their families are educated on danger signs, such as excessive bleeding, prolonged labor, or high fever, and are encouraged to seek skilled care promptly in case of such emergencies.

4. Empowerment and Decision-making: Empowering women and their families to be actively involved in decision-making related to maternal care increases the likelihood of choosing skilled care.

5. Supportive Social Networks: Community engagement is crucial for the success of BP/CR programs. Supportive social networks, including community health workers, local leaders, and community-based organizations, play a significant role in disseminating information, providing emotional support, and encouraging women to access skilled care services.

6. Health System Strengthening: The availability, accessibility, and quality of skilled care services within the health system also impact skilled care utilization. Strengthening healthcare facilities, ensuring the presence of skilled birth attendants, and improving the overall quality of maternal healthcare services are essential elements to support the implementation of BP/CR initiatives.

7. Cultural and Socio-economic Factors: The conceptual framework also considers cultural beliefs, socio-economic factors, and gender norms that may influence women's decision-making and access to skilled care.

Figure No – 4. Understanding motivation of community health workers in India - A Model-based Approach[92]

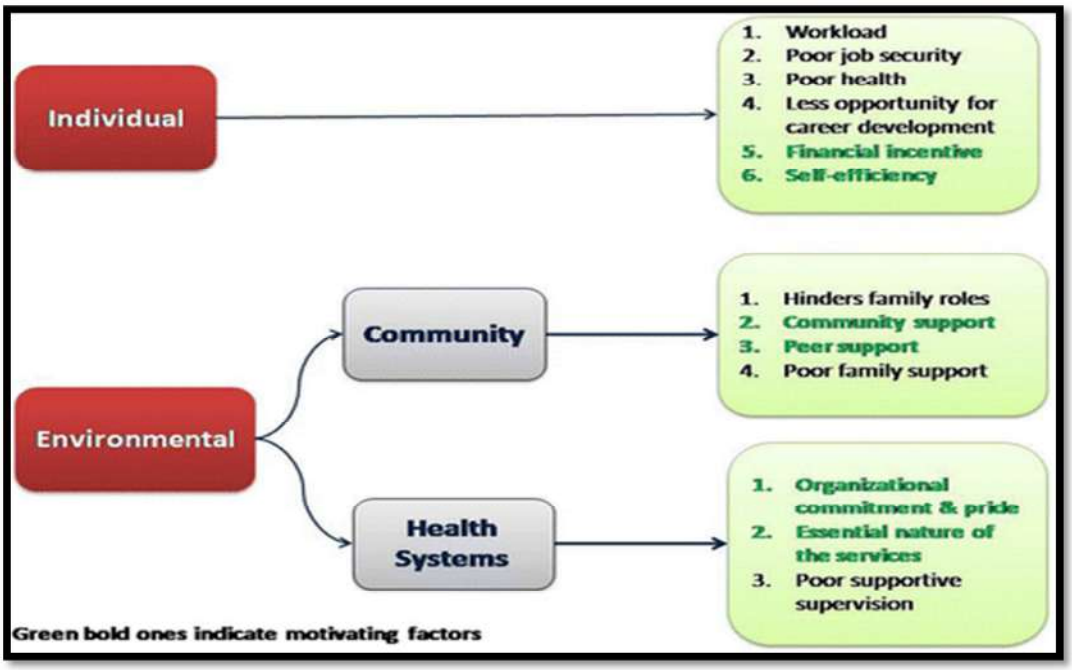
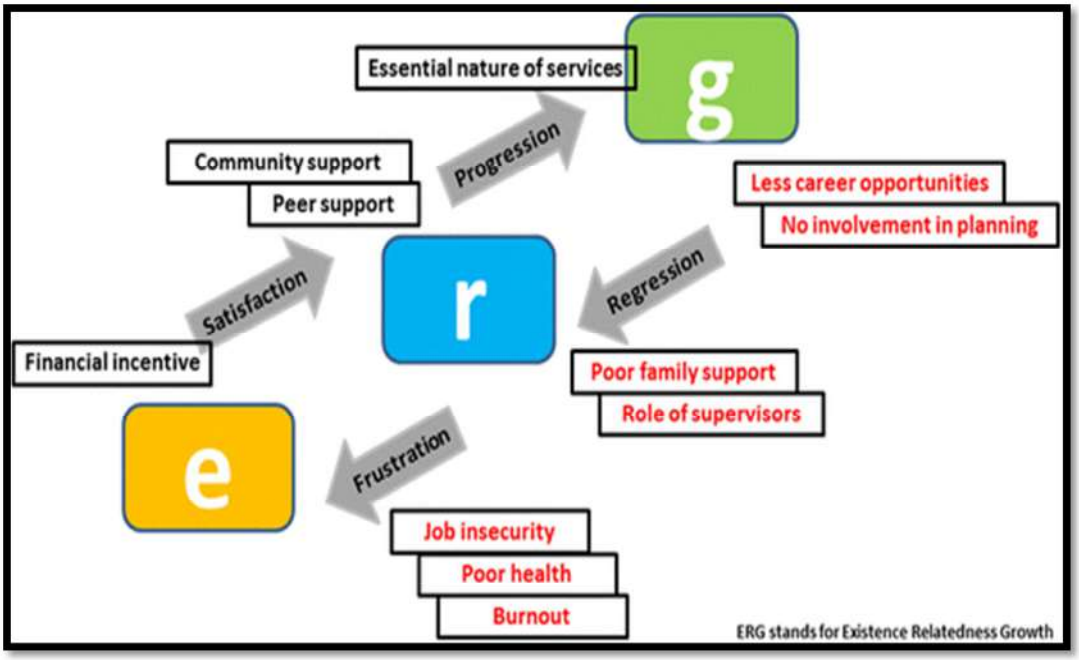


Figure No – 5. ERG (Existence Relatedness Growth) Theory of motivation[92]



The motivation of community health workers (CHWs) in India is a multifaceted and complex topic, influenced by various factors. CHWs are integral members of the healthcare system in India, particularly in rural and underserved areas, where they play a crucial role in providing basic healthcare services and health education to the community. Understanding their motivation is essential for ensuring their effectiveness and retention in the workforce. Some key factors influencing the motivation of CHWs in India include:

1. Altruism and Sense of Purpose: Many CHWs are driven by a strong sense of altruism and a desire to serve their communities. They see their role as an opportunity to make a meaningful impact on the health and well-being of their fellow community members, especially those who lack access to healthcare facilities.

2. Recognition and Respect: CHWs often seek recognition and respect from their community members for the valuable work they do. Being respected as knowledgeable health workers within their communities can be a significant motivating factor.

3. Training and Skill Development: Adequate training and skill development opportunities can enhance CHWs' confidence and job satisfaction. When CHWs feel competent in their roles and are equipped with the necessary knowledge and skills, they are more motivated to perform their duties effectively.

4. Incentives and Remuneration: Financial incentives and other non-monetary benefits provided to CHWs can be motivating factors. In India, many CHWs

receive incentives for their work, such as performance-based bonuses or allowances, which can contribute to their motivation.

5. Supportive Supervision: Regular and supportive supervision from higher-level healthcare professionals can boost CHWs' morale and motivation. Feeling valued and supported in their work can enhance their commitment to their roles.

6. Opportunities for Career Growth: CHWs may be motivated by opportunities for career advancement within the healthcare system. Some CHWs aspire to become health supervisors or pursue further education in the healthcare field.

7. Sense of Empowerment: Empowering CHWs to actively participate in decision-making processes and program planning can increase their motivation. When they feel their opinions are valued and have a say in how programs are implemented, they are more likely to be motivated and engaged.

8. Social Recognition and Social Networks: Being recognized as an important member of the community and having strong social networks can contribute to CHWs' motivation. Social support and encouragement from their peers and community members can further strengthen their commitment to their roles.

It's important to recognize that the motivations of CHWs can vary based on individual characteristics, local contexts, and the specific healthcare programs they are involved in. To ensure sustained motivation and effectiveness of CHWs in India, it is crucial for policymakers and healthcare organizations to address these factors and create an enabling and supportive environment for CHWs to thrive in their roles.

Evidence of CHWs in Birth Preparedness and Complication Readiness:

Global Scenario:

Developed countries have better statistics for maternal and child health. MMR and IMR are in single digits in many of the developed countries but the statics are very poor among developing and poorly developed countries like Asian and African countries. This may be attributed to poor health care delivery system, poor socioeconomic conditions, illiteracy, high population, traditional and cultural practices etc.

To combat all these problems and to achieve millennium development goal (MDG-5) which has now been replaced by sustainable development goals (SDG) many countries in Africa and Asia have invested in the cadres of CHWs.

Alternative titles for Community Health Workers (CHWs) in various countries are as follows:

- India - ASHA, Anganwadi worker, village health guide
- Pakistan - Lady health worker
- Bangladesh – Shasthya Shebika
- Ethiopia - Community health agent
- Ghana - Community or village health workers.

Although the titles are different but the role played by them remains the same all over the world. These CHWs are especially most relevant in rural setting. In Indonesia and Pakistan they work voluntarily, hardly few of them get meager salaries. In Malaysia transport cost was given to them. In India ASHA workers get honorarium and incentives for the services they render.[16-23]

A study carried out in Indonesia (1995) showed that case based remuneration has an impact on utilization of maternal services while salaried TBAs did not increase the utilization of maternal services. In Indonesia, CHWs also taught mothers about danger signs. TBAs in rural areas improved the accessibility to skilled providers and enhanced the complication referrals.[17]

In Guatemala (2002), the detection, rate and referral of post-partum complication increased by training TBAs. Training of TBAs had a positive effect but on overall rates of obstetric service utilization it was less convincing. At Hangu, Pakistan the results were less convincing for detection of complications, referral services and essential obstetric service utilization after the similar interventions.[23]

A community based intervention study at rural Tanzania (2021) found a significant increase in BPCR knowledge scores ($p<0.05$) in intervention group. The Community Based Continuous Training (CBCT) intervention was feasible and effective in increasing the BPCR knowledge in rural areas.[24]

In Rural Sidama, Ethiopia (2020) community extension workers provided focused antenatal care to the pregnant women which was highly utilized and appreciated by the community people but postnatal care and sick newborn care were insignificant.[25]

In Ethiopia (2019) Women's Development Army and Health Extension Workers worked together to improve the utilization of maternal and neonatal services to improve the outcomes which resulted in decreased maternal deaths, increased antenatal and delivery service usage and improved child immunization service uptake.[26]

In Rural Rwanda (2018), CHWs identify pregnant women, advice regarding TT vaccination, birth planning, nutritional supplementation, personal hygiene, medical insurance, HIV testing and counseling etc. CHWs reinforce BPCR through social gatherings and SMS alerts. They also provide postpartum and neonatal care services.[27]

Dickerson et al (2010) carried out a program evaluation in Tibet. One of the specific Pregnancy And Village Outreach Tibet (PAVOT) intervention was encouragement of development of a birth plan. Local healthcare workers were trained to educate pregnant women and families and make a birth plan. They found that majority of women attended more than3ANC visits but half of the women gave birth at home. Around 92% of the women got BPCR education, 80% received new born care education. All women received micronutrient supplementation and birth kits.[28]

In Pakistan (2011), lady health worker created awareness by addressing basic health issues and family planning. They mustered community participation by changing the attitude of their population towards health and provision of primary health care to all.[29]

CHWs in many developing countries play crucial roles like maternal and child health education, communicable and non-communicable disease awareness and services, community mobilization, referral services, increasing the utilization of various services and actual provision of the services. As CHWs are chosen from the same community they are close to the people of that community and they are rendering services right from primary health care approach to reaching population in the remote and inaccessible parts of the world.[30]

Nearly 70% of the population resides in rural areas of Bangladesh. Here the needs of the pregnant women were addressed by the community-based skilled birth attendant program through counseling the families and preparing for birth. They motivated the individuals and families through the information about ANC, PNC, immunization, family planning etc. CHWs were imparted with special skills to encourage the people to avail health services in low-income communities.[17,22,30,33,38,39]

In rural areas of West-Java, CHWs taught about care during pregnancy and need for skilled attendance at birth to pregnant women, their families and neighborhood.[35] In China CHWs gave health education and planned for obstetric emergencies. CHWs also provided the pre-natal services at the community level.[40]

CHW interventional studies throughout the world showed a significant impact on maternal and child health outcomes, pre-natal and post-natal service utilization indicators. CHWs were also trained in recognizing and referring of emergency obstetric complications (EmOC).[17-44]

In few interventions CHWs were practically trained to give tetanus toxoid injections to pregnant women. CHWs also had a role in recognition and management of anaemia during pregnancy with Iron folic acid supplementations, for malaria chemoprophylaxis, curative treatment for parasitic infections.[17,34,37,45]

In Matlab, a region of Bangladesh, iron-folic acid tablets, safe delivery kit and family planning aids and services were provided by CHWs. They also managed the child birth.[30,34] In Nepal, Misoprostol was used by the CHWs to manage post-partum haemorrhage. They provided iron-folic acid tablets to pregnant women, tetanus toxoid injections and post-partum home visits.12 Home deliveries were also conducted by them.[46,47]

A study at Bangladesh (2017) revealed that home visits by a health worker increased the BPCR practices among pregnant women compared to non-visits. One of the most effective methods to educate the pregnant women to improve the maternal and neonatal outcomes was home based counseling by CHWs in rural and hard to reach areas.[48]

Systematic Reviews:

Birth Preparedness and Complication Readiness (BPCR)

In a systematic review and meta-analysis conducted in Nigeria by Akinwaare et al (2023), the BPCR level was reported at 58.7% (95% CI 43.9 to 72.7%).[49] Similarly, a review in rural areas across developing countries by Maryuni (2022) found varying BPCR practices, with savings ranging from 46.8% to 88%, transportation identification from 18% to 76.3%, skilled provider identification from 15.7% to 100%, and birthplace identification from 44.3% to 85.8%. Blood donor identification, however, was notably lower, ranging from 0.89% to 29.6%.[50] Boltena (2021) study across Low and Middle-Income Countries reported male participation in BPCR at 42.4%, with specific factors like saving funds (54%) and identifying a skilled birth attendant (44%) showing varying levels of adherence.[51]

Maternal Education and BPCR

Ketema et al (2020) review in Ethiopia revealed that maternal education played a positive role in BPCR, with educated women having 2.44 times higher odds of BPCR than illiterate women.[52] Solnes Miltenburg et al (2017) review revealed that higher education levels were associated with improved BPCR.[53]

Community and Facility-Level Interventions

Solnes Miltenburg et al (2017) review emphasized the effectiveness of interventions at both community and facility levels in improving the utilization of healthcare systems during birth. Training of Traditional Birth Attendants (TBAs) and Community Health Workers (CHWs) yielded positive outcomes.[53]

Impact of Interventions on Health Facility Utilization

In a systematic review by Solnes Miltenburg et al (2015), various interventions resulted in a substantial increase in facility births (from 3.2% to 46.8%), improved BPCR knowledge, increased ANC visits and decreased neonatal deaths in the intervention group compared to the control group.[55]

Similarly, literature review by Chhabra (2016) highlighted an increase in health facility utilization for delivery among women with danger sign knowledge. Interventions including facility-based, home-based, or community-based approaches, led to increased BPCR and improved maternal and child outcomes.[54]

Indian Scenario: ASHA Workers

In India the community health workers are mainly ASHAs at grass-root level who are mainly appointed to look after the health of women and children in their respective communities and bring healthier outcomes. They are selected from the same community so that they can connect to the community people and gain their trust to render the services, create health awareness and mobilize the community towards healthier side. They have certain roles and responsibilities to play:

They act as:

1. Link workers – Connecting communities to healthcare resources
2. Social Activists – Advocating for health-related issues and social change
3. Community Health Workers – Providing essential healthcare services and education

They are trained through ASHA module which is a guide including the roles and responsibilities of ASHAs prepared by Government of India.

Although few rounds of formal trainings are given to ASHA workers during their service period their knowledge and service provision is comparatively poor. There are many barriers for ASHAs to render the quality work efficiently in the community like they are paid very less honorarium, more workload, other works are assigned to them apart from maternal and child health services, lack of regular supervision, lack of appropriate and adequate training and refresher trainings at regular intervals.

Sociodemographic Variables:

Age Group

Studies by Panda et al (2019) in Odisha and Chavan (2021) in Satara showed that majority of ASHAs fall into middle-aged category (30-40 and 41-50 years) 51.72% and 51% respectively. The percentage of ASHAs in the age group of <30 years varied significantly across the studies. Uttar Pradesh (2020) and Satara had a higher proportion of younger ASHAs (65% and 31% respectively) while Odisha showed a lower proportion of younger ASHAs (2.46%).[71,74,80]

In Belagavi, Karnataka (2021), 56% of ASHAs were in the 31–40 years age group. In rural Punjab (2022), 65.2% of ASHAs were above 35 years of age. A comparative study in Haryana (2022) reported that 55.7% of ASHAs were more than 36 years of age. In rural West Bengal (2015), the mean age was 31.84 ± 7.2 among 56 ASHAs.[11,58,59,96]

Marital Status

Gujarat (2018) and Karnataka (2015) reported similar percentages of married ASHAs, ranging from 86% to 90%. In rural Lucknow (2012), 96.4% of ASHAs were married. However, Odisha (2019) had a slightly lower percentage of married ASHAs at 76.92%. The proportion of ASHAs who were either unmarried, divorced, or widowed varied across the studies. Gujarat and Karnataka had a relatively similar percentage of such ASHAs at around 10.7% and 10.9%, respectively. Odisha had the highest percentage (23.57%) of unmarried, divorced, or widowed ASHAs.[80,86,98,114]

Type of Family

A study in Kolar (2021) showed a higher percentage of ASHAs in nuclear families (75.3%), and a study in Vijayapura (2020) indicated an even higher percentage (78.1%) of ASHAs belonging to nuclear families.[70,75]

Education Level

Studies in Haryana (2022) and Kolar (2021) showed a higher proportion of ASHAs with undergraduate education (34.3% and 23.3% respectively) while Satara (2021) showed least (5%). The percentage of ASHAs who completed high school (secondary level) education varied across the studies, with Satara showing the highest (70%) followed by Kolar (62%) and Haryana showing lowest (51.4%). Satara had the

highest percentage of ASHAs with primary level education (25%), followed by Haryana (14.3%) and Kolar (7.3%).[59,70,71]

Experience

Haryana (2022) had the highest proportion (88.6%) of experienced ASHAs, indicating a well-established and stable ASHA program in the region. Satara (2021) followed with 75% experienced ASHAs, while the tribal area of Tamil Nadu (2019) had the lowest proportion (57.8%). A study by Bhanderi et al (2018) in Gujarat found that 81% had >4 years of experience. The higher percentage of ASHAs (42.2%) with less than 5 years of experience were in the tribal area of Tamil Nadu.[59,71,79]

Main Variables:

Knowledge of Pregnancy Danger Signs

In a study by Azarudeen et al (2019), pregnancy danger sign knowledge level improved from 15% to 80% following the training program. Relatively higher knowledge scores (54%) observed in Satara (2021). Shah et al.'s (2018) mHealth intervention at a tribal area also resulted in a significant increase in knowledge levels, from 69.1% to 75%. Substantially lower knowledge scores (7.2%) were found in Koppal (2013). [71,79,85,107]

Several studies by Swain et al (2019), Rajendra et al (2016) and Kansal et al (2011) emphasized the need for regular training and refresher courses to address gaps in ASHAs' knowledge, particularly regarding complications during pregnancy. Sugandha's (2019) study in Mysuru found that 49.5% of ASHAs had knowledge of danger signs during pregnancy.[77,82,93,112]

Knowledge of ANC Visits

While ASHAs generally show good knowledge of ANC services as shown by Singh et al (2022), Panda et al (2019). Studies by Chaurasiya et al (2020) and Das (2012) suggest gaps in their implementation. In rural Haryana (2013), among 105 ASHAs, the majority had awareness about immunization, ANC, and family planning services. In Koppal (2013), ANC knowledge levels were more evenly distributed, with around 50.2% of ASHAs having good knowledge and 49.8% having average knowledge. In a study by Azarudeen et al (2019) ANC knowledge level improved from 60% to 100% following the training program. Sugandha's (2019) study in Mysuru found that only 51.5% of ASHAs had knowledge of ANC.[63,74,79,80,82,110,106,107]

Knowledge of Information provided to Pregnant Women

Sugandha's (2019) study in Mysuru reported that around 78% of the respondents knew about the information given by ASHAs for birth preparedness.[82]

Knowledge of Labor and Childbirth Danger Signs

In Tamil Nadu (2019), only 15% of ASHAs had knowledge of these danger signs before intervention, there was a remarkable improvement, with all (100%) ASHAs acquiring knowledge of labor and childbirth danger signs after the intervention. An interventional study in Andhra Pradesh (2014) also demonstrated a significant increase in knowledge scores of labor & childbirth danger signs from 24.96 ± 6.37 in pre-test to 42.18 ± 8.18 in post-test.[79,101]

Research by Kurapati and Thippaiah (2022) suggests that ASHAs possess valuable knowledge about labor and childbirth, but there are variations in their understanding of specific complications. For instance, the studies by Kochukuttan et

al (2013) and Sundararaman et al (2012) underline the importance of continuous training to improve ASHAs' competence in identifying and managing childbirth complications.[56,107,109]

Knowledge of Birth Preparedness

Research by Taksande et al (2021) and Akshaya and Shivalli (2017) indicates varying levels of awareness and practice of birth preparedness among ASHAs. A study in Mysuru (2019) reported that 67.5% of the participants had adequate knowledge of birth preparedness. A study in Jaipur city by Meena et al (2016) reported a high knowledge level of 84.88%. A study by Singh et al (2022) in Northern India reported knowledge level of 65.9%. Kochukuttan et al (2013) study in Koppal reported a higher percentage of ASHAs with good knowledge (71%) and a lower percentage with poor knowledge (27.5%).[63,72,82,89,107,133]

Knowledge of Postpartum Danger Signs

Studies by Kurapati and Thippaiah (2022) and Swain et al (2019) indicate that ASHAs had lower awareness of postpartum danger signs. Shah et al's (2018) study in tribal areas of Gujarat, knowledge score in both intervention and control groups was 52.4%. Kochukuttan et al (2013) study in Koppal, only 7.2% of ASHAs demonstrated average knowledge, while a strikingly high percentage of 92.8% had poor knowledge.[56,77,85,107]

Knowledge of Postpartum Care

Sugandha (2019) study in Mysuru reported a significantly higher percentage of postpartum care, with 86.1% demonstrating good knowledge. Meena et al (2016) study in Jaipur City reported a much higher knowledge level of 85.46%.[82,133]

Knowledge of Baby Care

Azarudeen et al (2019) study reported a remarkable increase in baby care knowledge from 55% before training to 98% after training of ASHAs.[79] Shah et al (2018) study reported a significant increase in baby care knowledge from 57% in control group to 75% in intervention group.[85] Studies by Ray and Bidari (2020) and Sugandha (2019) highlight that ASHAs exhibit varying levels of knowledge and practice in neonatal care.[79,82] Pattnayak et al (2019) revealed that 45% ASHAs had new born baby care knowledge and 38.57% had skills in managing LBW and preterm babies.[81]

Saxena et al (2017) revealed that 39.15% of ASHAs were not knowing about delayed bath to new born, 62.5% were knowing about umbilical cord care, 96.9% were knowing about immediate breastfeeding (within 1 hour) to the new born.[88] Mahyavanshi et al (2011) revealed that newborn care knowledge was 86.2%.[118]

Knowledge of Breastfeeding

Azarudeen et al (2019) study reported a substantial increase in exclusive breastfeeding knowledge from 63.9% before training to 98.73% after training. Both studies showed a statistically significant improvement.[79] In Shah et al (2018) study, there was no significant change in ASHAs' knowledge of breastfeeding, as both the control and intervention groups had a knowledge score of 94.5%.[85]

In a study conducted by Kaur et al (2022) in rural Punjab, it was observed that ASHAs knowledge regarding initiating breastfeeding within the first hour was limited, with only 23.6% being aware of this crucial practice.[57] Pal et al (2019) revealed that ASHAs had poor knowledge in breastfeeding practices.[83] Shashank et al

(2015) revealed that 73.5% of ASHAs had exclusive breastfeeding knowledge and 69.7% had knowledge about duration of breastfeeding.[100] Saxena and Kumari (2014) found that 98% ASHAs had exclusive breastfeeding knowledge.[103] Swetha et al (2021) in Belagavi revealed that 88% of ASHAs were aware about colostrum.[124]

Practice of ANC Service Provision

Karol et al (2014) study in Rajasthan found that ASHAs' practice of ANC service was 67.33%.[102] Shukla and Bhatnagar (2012) study in Uttarakhand found that ASHAs provided ANC services at a rate of 69.7%.[113] Kori et al (2015) revealed that around 73.85% and 70.4% of ASHAs gave ANC counseling and family planning services respectively.[94] Bhattacharya et al (2015) revealed that ASHAs facilitated 90% of ANC registration, 76.69% ANC check-up, 67.88% IFA prophylaxis, 80.23% laboratory tests, 70% JSY benefits.[95] Waskel et al (2014) found that majority of ASHAs were knowing about ANC services.[104]

Practice of Birth Preparedness Services

A systematic review conducted by Maryuni (2022) focused on BPCR practice in rural areas of developing countries. The overall BPCR practice ranged from 32.78% to 61.8%, suggesting a wide variation in adherence to BPCR guidelines across different settings and countries.[50] Singh et al (2022) study in Northern India found a higher practice score of 65.9%.[63]

Kari and Angolkar (2021) study found a practice score of 49.1%.[11] Padda et al (2013) revealed that 92.6% of urban women delivered in hospital.[105] Mony and Raju (2012) in Karnataka found that ASHAs play an important role in improving maternal

and child health by ANC services, institutional deliveries and immunization services through home visits, creating awareness, mobilizing the community.[108]

Impact of ASHA Interventions

Studies by Nadella et al (2021) and Modi et al (2019) reveal positive outcomes associated with ASHA interventions, including increased ANC utilization, improved quality of services, and reduced infant deaths.[68,127] Shah et al (2018) mHealth intervention at a tribal area also resulted in a significant increase in knowledge levels, from 69.1% to 75%.[85] A study from rural Bihar by Burger et al (2022) revealed that ASHAs play an effective role in influencing the positive behaviours of mothers compared to other health influencers.[60]

A pre-test and post-test at Pune by Khan et al (2020) found that pre-test birth preparedness knowledge was poor in 20% mothers, average in 66.7% and good in 13.3%. In post-test 95% of them had good knowledge and only 5% had poor knowledge. Birth preparedness increased the birth preparedness knowledge significantly.[76] An interventional study at Haryana (2011) showed that knowledge scores increased after training.[116] Bajpai and Dholakia (2011) found that ASHAs did not understand completely their roles and responsibilities as they did not undergo stipulated training.[117]

Strengths of ASHAs

A qualitative study by Blanchard et al (2021) at rural Uttar Pradesh revealed that home visits by ASHAs helped them to build positive relationships with women, provide information regarding various maternal services, schemes and practical

support in accessing maternity care. ASHAs encouraged poor, unprivileged, lower caste group to deliver in public health facilities. [65]

Debbarma et al (2021) study revealed that positive factors influencing ASHAs were job satisfaction, dignity in society, family support, work hour flexibility etc.[69] Thomas Thattil at al (2019) in Karnataka found that self-satisfaction, team work and social support motivated ASHAs.[84] Guha et al (2018) revealed that positive factors which influenced ASHAs performances were supervision, appraisal, family and community support etc.[87]

Challenges Faced by ASHAs

Studies by Mendhe et al (2022) and Manjunath et al (2022) identified common challenges faced by ASHAs, such as insufficient pay, excessive workload, lack of proper supervision, and limited access to technology.[61,64] In rural West Bengal (2015), among 56 ASHAs, 73.21% were inadequately trained and 39.29% were not satisfied with their job.[96] A study in rural Maharashtra (2020) revealed that ASHAs were biased with incentive-based performance due to their lower economic condition and job satisfaction was low in 58.5% of ASHAs.[73]

A study conducted by Kawade et al (2021) at rural and tribal PHCs of Pune, noted that ASHAs faced challenges in balancing their workload, indicating potential stress and burnout.[66] In Himachal Pradesh (2022), around 40% had unsatisfactory training, 43.3% had stress, 20.7% had harassment by hospital staff and two-thirds of ASHAs failed to reach target because of excessive workload. Majority of the ASHAs were not satisfied with their monthly income.[62]

Rajbangshi et al (2021) found that ASHAs faced challenges in working conflict hit areas due to difficult transportation and service breakdown. They felt risk regarding physical safety and security during conflicts. Dehury et al (2017) in tribal pocket of Odisha found that ASHAs face challenges in ANC and delivery stage due to inadequate training and capacity building.[90] Shashank and Angadi (2015) found that ASHAs were unaware about new roles and responsibilities.[97]

Lipekho et al (2015) at rural Manipur revealed that ASHA selection was politically influenced. Link PHCs were ill-equipped which was major issue for service provision and trust gain for ASHAs in community.[99] Joshi and George (2012) revealed that ASHAs were biased with incentive-based performance because of their lower economic condition.[111] Ghosh et al (2021) in Kharagpur revealed that ASHA workers possess limited expertise in managing high-risk pregnancy cases, indicating a potential requirement for enhanced training.[125]

Association of sociodemographic factors with BPCR Knowledge and Practice among ASHAs

A community-based study by Joseena (2020) in Kerala found that educational status had a noteworthy correlation with knowledge scores.[126] A study at Gujarat by Bhanderi et al (2018) found that there was an association between ASHAs performance and last training received.[86] A study by Kochukuttan et al (2013) in rural Karnataka revealed that knowledge was significantly associated with recent and repeated training of ASHAs.[107]

A systematic review by Solnes Miltenburg et al (2017) revealed that an intervention at both community level and facility level improved the utilization of health care system at birth. Higher education level was positively associated with

improved BPCR levels and better results.[53] An interventional study at Andhra Pradesh by Renuka et al in (2014) revealed that ASHAs with higher education and more age had higher pre-test score.[101]

Effect of training on Mothers' Knowledge and Practice of BPCR

A systematic review conducted to evaluate status of BPCR among pregnant women in Ethiopia by Berhe et al (2018) revealed that 32% of the women were adequately ready for childbirth. Around 26.33% of expectant mothers were knowledgeable about warning signs during pregnancy.[129]

A systematic review by Solnes Miltenburg et al (2015) to assess the effect of BPCR interventions revealed that in majority of the studies following intervention, a rise in BPCR knowledge was seen.[130] In a quasi-experimental study at Uttar Pradesh by Baqui et al (2008) intervention district demonstrated enhanced coverage in all essential newborn care indicators.[123]

A cluster-RCT in Uttar Pradesh by Kumar et al (2012) revealed improvements in birth preparedness, umbilical cord care, and breastfeeding in intervention arm.[115] A study by Izudi et al (2019) showed health education regarding BPCR notably led to a significant increase in SBA utilization, but it did not show the same effect on early postnatal care (EPNC) utilization.[131]

Cross-sectional studies conducted in Indore City by Agarwal et al (2010), in Udupi taluk by Gurung et al (2017), in rural Rwanda by Kalisa et al (2018) revealed that 20-50% of expectant mothers were adequately ready for delivery.[27,120,128]

A study in South Wollo, Northwest Ethiopia by Bitew et al (2016) found that only 24.1% expectant mothers were adequately ready for delivery. Pregnant women's

knowledge of pregnancy, delivery, and postnatal danger signs were 23.2%, 22.6%, and 9.6%, respectively.[132]

A cluster-RCT in Shivgarh, Uttar Pradesh by Kumar et al (2012) revealed that in intervention arm birth preparedness and ANC visits increased significantly and neonatal mortality reduced to 54%. Recognition of danger signs, early initiation of breastfeeding, ski to skin care and institutional deliveries increased significantly in intervention arm. Half (50%) of the women opted for care of danger signs within 1 hour.[115]

A study in rural Lucknow (2010) found that educated and younger pregnant women were more likely to utilize ASHA services. Higher education was associated with higher levels of BPCR.[119] Singh et al (2012) revealed about higher ANC registration.[114] BPCR was significantly high (50.9%). Although, knowledge of danger sign (18.6%), 1st ANC registration (24.1%) and transport services (18.6%) were low.[122]

Darmstadt et al (2010) conducted a cluster RCT in Bangladesh to promote BPCR which showed 91% ANC coverage, 69% PNC home visits. Knowledge and practice of BPCR danger signs improved in intervention arm.[121]

Mobile application model was used in an intervention study at Indonesia by Santoso et al (2017) to train couples on BPCR. Counseling and android app together increased the knowledge score of husbands from 60.4% to 72.9% ($p<0.0000$) as compared to counseling alone (only 2% increase). Mobile app also reduced 3 delays.[91]

JUSTIFICATION OF THE STUDY

Across the globe, maternal and neonatal mortality remains a pressing and substantial issue in the field of public health, especially in resource-constrained settings. Improving BPCR among ASHA workers and expectant mothers has the potential to reduce maternal and infant deaths, making it a crucial area of investigation.

Role of ASHA Workers: Contribution of ASHA workers is crucial in delivering healthcare services, including antenatal care and support to pregnant women in rural and underserved areas. As they are not adequately trained and well-equipped to carry out their functions, there are many lacunae in health outcomes.

Health care delivery system is not functioning appropriately which is a hindrance for their efficient service provision. Lack of regular monitoring and supervision by higher authorities also has a negative impact on functioning of ASHAs. Assessing and enhancing their knowledge and practice of BPCR can lead to better support and care for pregnant women, ultimately contributing to improved maternal and child health outcomes. [62, 64, 99]

Addressing Gaps in Knowledge: While the importance of BPCR is acknowledged, there might be gaps in understanding its implementation and effectiveness in specific communities. This study helps address these gaps and provides valuable insights into the impact of intense training and health education on BPCR practices among ASHAs and pregnant women.

Strengthening Community-Based Healthcare: ASHA workers are at the forefront of community-based healthcare delivery. Strengthening their knowledge and capacity in BPCR can enhance the overall quality of maternal and child healthcare services at the grassroots level.

Literature review revealed that studies on BPCR in India are limited and quality of evidence is very low from the previous BPCR interventions. ASHAs have poor knowledge and practices towards BPCR. Hence, WHO has emphatically endorsed the implementation of BPCR interventions and further research.

There is a scarcity of interventional studies that evaluate the effectiveness of BPCR packages implemented through ASHAs. Moreover, there are limited comprehensive studies in India that assess the knowledge and performance of ASHA workers concerning BPCR.

Overall, conducting this study is justified due to its potential to contribute significantly to improving maternal and child health, empowering healthcare workers and pregnant women, and guiding evidence-based policy and practice to address a critical public health issue. Governments and health organizations can use this evidence to design and implement targeted interventions to improve BPCR and reduce maternal and infant mortality rates.

RESEARCH QUESTION

What is the feasibility and acceptability of implementing Birth Preparedness & Complication Readiness plan through Accredited Social Health Activists (ASHAs)?

OBJECTIVES

Primary Objective

To assess the feasibility and acceptability of Birth Preparedness & Complication Readiness plan by Accredited Social Health Activists (ASHAs) through following methods:

1. Acceptability of BPCR plan through evaluation of knowledge and practice of BPCR among ASHAs
2. Feasibility assessment through training of ASHAs on BPCR plan and its implementation on pregnant women in their catchment area

Secondary Objective

To study the effect of training ASHAs by evaluating knowledge and practice of BPCR plan among recently delivered mothers

MATERIALS AND METHODS

This section presents the methods that were used in the present study. It includes study design, study setting, study population, study implementation, data collection procedure etc., in detail.

Study Design:

A Quasi-Experimental Pre-Post Study Design was implemented.

A quasi-experiment is an empirical interventional study used to estimate the causal impact of an intervention on target population without random assignment. Quasi-experimental studies are often used when randomization is not feasible or ethical, such as when studying the effects of interventions in real-world settings, assessing the impact of policies or programs etc. This study is considered quasi-experimental as the study participants were not selected by employing random assignment.

Study setting:

Study was carried out in rural region of Belagavi district. Belagavi is the biggest district of Karnataka. Belagavi also known as Belgaum or Venugrama meaning “Bamboo Village” is located along the Western Ghats in the northern part of Karnataka. Maharashtra and Goa are the 2 border states of Belagavi. As per census 2011 data, Belagavi caters a population of around 4.8 million with an area of 31,415 km^2. Rural Belagavi caters a population of 35, 68, 466 and urban population is 12,11,195. Average literacy rate of Belagavi is 73.48%, male literacy rate being 82.20% while female literacy rate of 64.58%. Urban sex ratio is 979 while rural sex ratio is 970 females per 1000 males. There are 24 primary health centres (PHC) and

68 subcentres in Belagavi district. The languages mostly spoken in this region are Kannada, Hindi and Marathi, Kannada language being the official language.

Source of Data:

Rural region of Belagavi Taluka comprises eleven (11) Primary Health Care Centres (PHCs) and a single Community Health Care Centre (CHC). Each health centre was considered as one cluster. Two PHCs were selected among 11 PHCs by simple random sampling method (Lottery Method) and single CHC was included in the study.

Figure No – 6. Belagavi Taluka Map showing Health Institutions

Study clusters:

Name of the cluster	No. of Sub-centres	No. of ASHAs	Population
Hirebagewadi	6	34	39,018
Sulebhavi	5	32	37,775
Bhendigeri	6	34	35,680

Hirebagewadi is a CHC with 39,018 population which is situated 20.3 km from Belagavi. Sulebhavi is a PHC with 37,775 population and is situated 23.1 km from Belagavi. Bhendigeri is another PHC with 35,680 population which is situated 28.8 km from Belagavi.

Study Duration:

The present study was carried out from August - 2017 to July - 2023

Study Population:

Study Population for Primary Objective: ASHAs

1. ASHA Workers: Present study incorporated all ASHAs from three (3) selected clusters within the rural region of Belagavi Taluka who met the specified inclusion criteria.

Inclusion Criteria:

- ASHAs working in three (3) selected clusters were included.

Exclusion Criteria:

- ASHAs who did not give informed consent were excluded.
- ASHAs having less than 6 months of experience were excluded.

Study Population for Secondary Objective: Mothers

2. Recently delivered mothers (within a year): Two (2) different groups of recently delivered mothers (within a year) were included for Baseline Cross Sectional Survey and Endline Cross Sectional Survey to assess the effect of ASHA training on implementing the BPCR plan.

Inclusion Criteria:

- Recently delivered mothers (within a year) were included.
- Baseline Survey: Mothers who delivered from January 2019 to December 2019
- Endline Survey: Mothers who delivered from January 2021 to December 2021
- Only mothers who registered under respective ASHAs during pregnancy and delivered were included.
- Mothers who delivered in both private and public hospitals were included.

Exclusion Criteria:

- The pregnancies undergoing MTP were excluded.
- Mothers who did not give informed consent were excluded.

Sample Size:

Sample size for Primary Objective: ASHAs

ASHAs - Complete list from the three study clusters (**n = 100**) were included.

- Hirebagewadi – 34
- Sulebhavi – 32
- Bhendigeri - 34

Sample size for secondary objective: Mothers

Recently delivered mothers (within a year) - Two (2) different groups of recently delivered mothers (within a year) were included. A Baseline Cross Sectional survey was conducted among 400 mothers (n=400) before BPCR training of ASHAs and an Endline Cross Sectional survey was conducted among 400 mothers (n=400) after BPCR training of ASHAs to assess the effect of implementation of BPCR plan.

Previous literature[120, 122] revealed that almost 50% mothers adhere to BPCR plan, sample size was achieved using the following formula:

$$n = \frac{z^2 \times p \times q}{d^2}$$

Where, n= number of subjects required,

z = 1.96, Standard normal variate value (95% C.I.)

p = 50 %

q = (100-p) = 50%

d= 5 % (as error)

Hence Mothers' sample size = $\frac{(1.96)^2 \times 50 \times 50}{25}$ = **400**

Hence Mothers' sample size for each group was: **n=400**

1. Without Training group of Mothers: Before training of ASHAs - **n=400**

2. With Training group of Mothers: After training of ASHAs - **n=400**

Sampling Technique (ASHAs): Complete Enumeration

Sampling Technique (Mothers): Four (4) recently delivered mothers (within a year) were selected using a Simple Random Sampling approach (lottery method) from the registered list of mothers under each ASHA.

Data collection Tool: Data collection was done by using a standard, pre-designed, pre-tested and semi-structured questionnaire by **Johns Hopkins Program for International Education in Gynaecology and Obstetrics (JHPIEGO)** which was customized to our study population. Questionnaire had two parts. First part was the sociodemographic profile and the second part consisted of questions to assess knowledge and practice regarding BPCR.

Feasibility & Acceptability Tool: The tool was adapted from System Usability Scale (SUS). (https://www.usability.gov/how-to-and-tools/methods/system-usability-scale.html)

Pilot Study: A Pilot study was conducted on 10% of sample size of ASHAs (n=10) in a PHC which was not a part of our study cluster, to test the feasibility and to validate the Data Collection Tool.

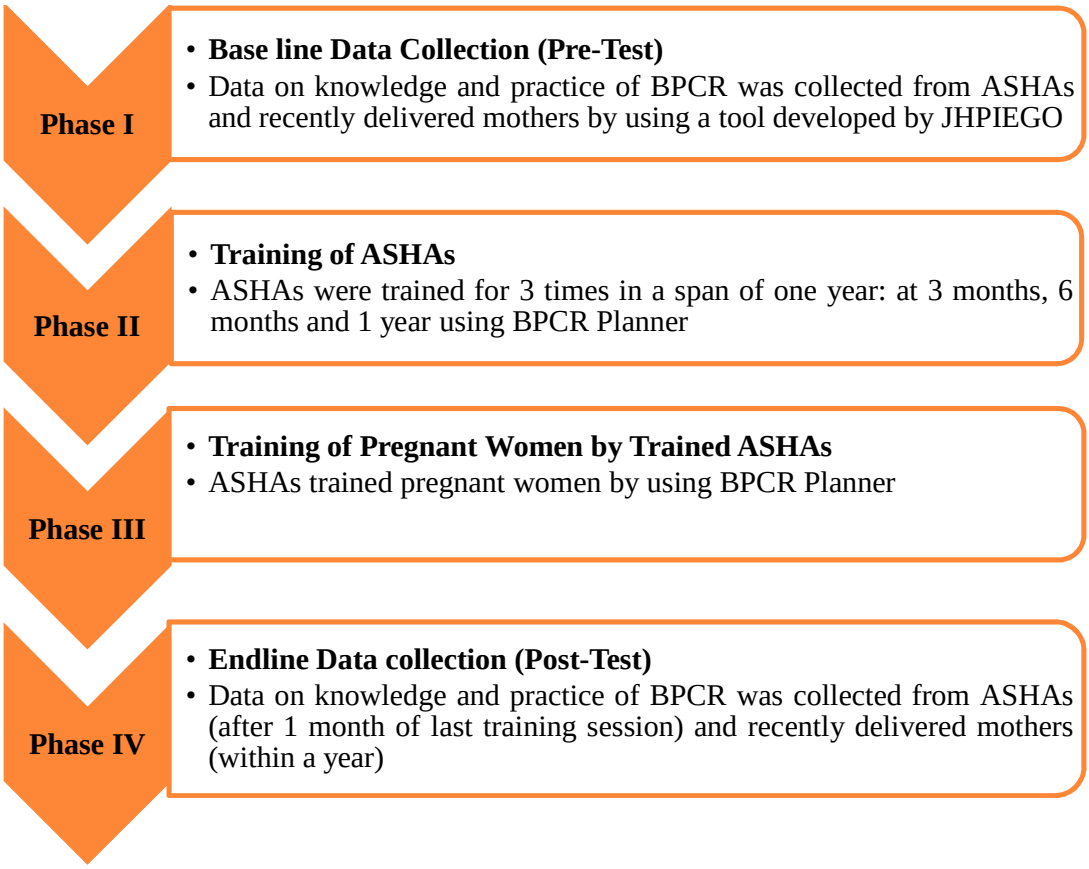
Ethical clearance:

- Ethical Committee on Human Subjects for Ph.D. Research Project, KLE Academy of Higher Education and Research (KAHER), Belagavi granted Ethical Clearance for conducting the study.
- Permission was obtained from the Project Director (RCH), Department of Health and Family Welfare, Govt. of Karnataka to collect data from ASHAs.

Informed Consent: Informed consent form was prepared in vernacular languages for the clear understanding of the participants. There was a brief explanation about the study, data collection procedure, risks and benefits in informed consent form. Study participants were explained in brief about the study and the confidentiality. After expressing their willingness to take part in the study, individual eligible participants provided written consent.

Confidentiality: Stringent measures were implemented to safeguard the confidentiality and privacy of study participants by refraining from disclosing their names, identities, and workplace information.

Study Implementation



Baseline (Pre-test) Data Collection from ASHAs: A baseline survey (Pre-test) was conducted on ASHAs. Before the study commenced, participants received a detailed explanation of the research objectives. Subsequently, written informed consent was obtained individually. Each participant was interviewed to know knowledge and practices regarding BPCR.

Baseline Data Collection from Without-Training group of Recently Delivered Mothers (within a year): Baseline Data was collected from **Without training group** of Recently Delivered Mothers (within a year). Before the study commenced, participants received a detailed explanation of the research objectives. Subsequently, written informed consent was obtained individually. Each participant was interviewed to know knowledge and practices regarding BPCR.

Study Implementation on ASHAs: Training of ASHAs on BPCR

BPCR planner:

BPCR planner (a pictorial pamphlet on birth plan) that promotes key maternal and neonatal practices and birth preparedness was prepared and provided to all ASHAs during the training period to distribute & train eligible pregnant women in her area. Three rounds of meticulous training were provided to ASHAs using **BPCR Planner** at 3 months, 6 months and 1 year interval on BPCR.

It was an Educational Intervention. BPCR pamphlet was used for lecture using chalk & talk method to train ASHAs. The duration of training was approximately 1 hour each time.

All ASHAs were educated regarding the unpredictable complications arising during the whole course of pregnancy, intra-partum (during labor & delivery) period and post-partum (42 days after delivery) period, how to identify them and how to be prepared to face them. They were also educated to prepare a birth plan for each pregnant woman in consultation with her family members.

After 3 months of training, knowledge retention was checked by oral questions and refresher training was provided. Again after 6 months, retention was checked and refresher training was provided. Finally, after 1 year, retention for BPCR knowledge was checked through thorough questioning and final refresher training was provided using lecture through chalk and talk method to all the participants.

One month after the final educational intervention, all participants were interviewed and post-test data was collected using the same questionnaire which was used for pre-test data collection.

Key Strategy of BPCR intervention was to train ASHAs to:

1. Register eligible pregnant women in her catchment area as soon as possible in first (1^{st}) trimester,
2. Meet 4 times each woman at her antenatal period and provide necessary health care,
3. Provide health education and counseling regarding BPCR and recognition of maternal and newborn danger signs during antenatal period, intranatal period and postnatal period to pregnant women and her family members,
4. Provide health education regarding consumption of nutritious food, proper rest and personal hygiene,
5. Provide health education regarding New Born care practices,

6. Prepare a Birth Plan discussing with pregnant woman and her family members,
7. Visit each woman 2 - 3 times after delivery to assess the health of the mother and newborn and look for any danger signs.
8. Provide information regarding use of modern Family Planning Methods to space or limit births.

BPCR plan implemented through ASHAs included:

1. Early identification of the danger signs and seeking care from the health facility,
2. Finding the closest skilled-birth attendant or healthcare facility for childbirth,
3. Selecting an appropriate health facility for emergency or referral purposes,
4. Identifying a birth companion,
5. Organizing transportation for delivery and/or obstetric emergencies,
6. Setting aside funds for childbirth and/or obstetric emergencies,
7. Determining suitable blood donor in the event of an emergency.

Promoting behaviours provided by ASHAs in antenatal (ANC) period included:

1. Receiving a minimum of four ANC visits conducted by a qualified healthcare provider,
2. Obtaining 2 doses of tetanus toxoid (TT) immunizations,
3. Consuming Iron Folic Acid (IFA) tablets for 4 to 5 months,
4. Consumption of nutritious food more frequently in small quantities and proper rest,
5. Nutritional counseling to pregnant women,
6. For high-risk pregnancies every month ANC visit under Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA).

New born care practices of mothers which were encouraged via educational intervention by ASHAs included:

1. Immediately drying and wrapping the newborn after delivery,
2. Practicing immediate (within 1 hour) and exclusive breast feeding for 6 months,
3. Feeding colostrum (first breast milk of the mother) to the newborn within 1 hour,
4. Postponing the initial bath of the newborn for at least 6 hours to safeguard against hypothermia,
5. How to take care of umbilical cord (cord care),
6. Having the newborn examined by a qualified healthcare provider.

Training ASHAs about complications during Pregnancy, Labor & Childbirth and Postpartum period:

Condition	Key Danger Signs	Other Danger Signs
Pregnancy	1. Severe vaginal bleeding 2. Swollen hands/face 3. Blurred vision 4. High BP	1. Convulsions 2. Severe weakness 3. Severe abdominal pain 4. Water breaks without labor 5. Accelerated/reduced foetal movements 6. Difficulty in breathing 7. Loss of consciousness
Labor & Childbirth	1. Severe vaginal bleeding 2. Prolonged labor>12 hours 3. Convulsions 4. High BP 5. Retained placenta >30 minutes	1. Severe headache 2. High fever 3. Loss of consciousness

Postpartum Period	1. Severe vaginal bleeding 2. High fever 3. Malodorous vaginal discharge 4. High BP	1. Loss of consciousness-Blurred vision 2. Severe weakness 3. Difficulty in breathing 4. Convulsions 5. Severe headache
Knowledge & Practice Scores	Each of these Key Danger Signs and Other Danger Signs were assigned a score of 1. Equal weightage was given to each option. Answered option carried – '1' score and unanswered option carried - '0' score. All other questions from the questionnaire were assigned in a similar manner (Yes-1, No-0).	
Levels of Knowledge & Practice Scores	Levels of knowledge and practice were calculated by adding all scores and converting them into percentages for each participant. Mean and Standard Deviation (SD) were calculated, then they were categorized as follows: **Low Level**: Scores **Below Mean-SD** **Moderate Level**: Scores **Equal to Mean±SD** **High Level**: Scores **Above Mean+SD**	

Implementation of BPCR plan among Pregnant Women by ASHAs

Training of Pregnant Women on BPCR by Trained ASHAs:

BPCR planner was used by ASHA to educate pregnant woman and her family members regarding pregnancy complications and to prepare a Birth Plan for each pregnant woman who has registered under her in her catchment area. All ASHAs counseled and gave health education and knowledge to pregnant woman and her family members regarding danger signs of pregnancy, labor and childbirth, postpartum and new born danger signs, importance of ANC check-ups, TT injections, consumption of IFA tablets and calcium tablets.

Pregnant women were also trained regarding new born care, importance of keeping the baby warm by wrapping the baby in clean clothes and delaying the bath at least for 6 hours after birth, immediate (within 1 hour after delivery) breastfeeding, umbilical cord care, exclusive breastfeeding, immunization of the new born, postpartum care of the mothers for 42 days, consumption of nutritious food, personal hygiene, and family planning methods.

They prepared a birth plan using BPCR planner in consultation with pregnant woman and her family members by:

- Recognizing a nearby health facility for birth and emergency
- Recognizing a referral hospital for emergency complications
- Identifying 3 blood donors by checking compatible blood group and Rh factor from relatives
- Identifying 3 birth companions in consultation with relatives and neighbours
- Identifying 3 local transportations for emergency and delivery

They also identified sources of emergency funds like Self-Help Groups (SHGs), Mahila Mandals, micro financing agencies, societies, etc. and saving money regularly for emergencies, delivery and transportation. The key aspect of birth planning involves collecting and writing contact (mobile) numbers in the birth planner to ensure timely communication with relevant individuals during emergencies.

Pregnant woman and her family members identified the service providers, collected and noted their contact numbers on BPCR planner with help of ASHAs for emergency contact.

Endline (Post-test) Data Collection from ASHAs:

After one month of final training session of ASHAs, post-test interview was conducted by using the same semi-structured questionnaire which was used to collect baseline (pre-test) data.

Endline (post-test) data was collected to assess the knowledge and practice of BPCR, feasibility and acceptability of implementing BPCR plan and associated factors. Standard Feasibility and Acceptability tool which was adapted from System Usability Scale (SUS) was used to collect data regarding feasibility and acceptability of BPCR plan.

Endline Data Collection from With-training group of Recently Delivered Mothers (within a year):

An endline survey was conducted on **With-training group** of recently delivered mothers (within a year) who were registered under respective ASHAs, underwent BPCR training by ASHAs and delivered to study the effect of implementation of BPCR plan through ASHAs using the same questionnaire which was used for baseline data collection.

Data Analysis:

Data entered into Excel, processed to ensure accuracy and then analyzed utilizing the statistical software SPSS version 22. Appropriate tables and figures were used to present the results.

Data analysis involved the application of descriptive and inferential statistics. Descriptive statistics encompassed mean, standard deviation, percentage. Inferential statistics included Dependent t-test, Independent t-test, Chi-Square (χ^2) test, McNemar test, Multiple Logistic Regression models. To assess the association, the researchers utilized the odds ratio and p-value, $p<0.05$ was deemed statistically significant.

1. Pre-test and Post-test knowledge and practice scores of ASHAs were compared using a Dependent t-test
2. McNemar test was used to know the levels of knowledge and practice scores of ASHAs.
3. Chi-Square ($\chi 2$) test was employed to determine the association between knowledge levels and sociodemographic profile.
4. Knowledge and practice scores of Without training and With training group of mothers were compared using an Independent t-test
5. Relationship between socio-demographic factors and the knowledge and practice of ASHAs concerning BPCR was examined using a Logistic Regression Model.

Operational Definitions:

In this study, the terms used have been operationally defined to ensure precise comprehension.

Age: The age was recorded as the nearest completed years.

Religion: It refers to a structured set of beliefs, rituals, and regulations followed to worship one or more deities, such as Hinduism, Islam, and Christianity.

Education: Schooling status of the participants as per self-report of participants.

Illiterate: Refers to an individual who lacks the ability to read and write.

Literate: Describes an individual who possesses the ability to read and write.

Primary Education: Individual having completed education up to 7th grade.

Secondary Education: Individual having completed education up to 10th grade.

Undergraduate: A person who has completed up to pre-university /diploma /below degree class.

Graduate: The person who possesses a graduation in any field

Postgraduate: A person who possesses a master's degree in any field

Type of Family: The Family was categorized into Nuclear and Joint Family.

Nuclear Family: It comprises a married couple and children, who are considered dependent on their parents and share the same kitchen.

Joint Family: It comprises several married couples and their children residing in the same household and sharing a common kitchen.

BPL families: Families having Below Poverty Line cards with low income

APL families: Families having Above Poverty Line cards with moderate to high income.

Monthly Income of Family: Cash earning by all means of occupation by all the family members is termed as family monthly income expressed in Indian rupees.

Occupation: Daily work carried out by participants and family members for economic gain and maintenance of livelihood.

(Ref: National Classification of Occupations – www.ncs.gov.in)

Skilled Worker: A skilled worker is someone who has specialized training, knowledge, and abilities in their work. This category includes occupations that require specific skills acquired through training or experience, such as carpenters, electricians, mechanics, and technicians.

Service Worker: A service worker is employed in sectors that provide services rather than goods. This includes a wide range of occupations such as teachers, healthcare workers, administrative staff, clerks, and other professionals and semi-professionals.

Self Employed: A self-employed person operates their own business or trade and is not employed by an employer.

Agricultural Worker: An individual engaged in activities related to farming and agriculture, which can include cultivating crops, tending to livestock, and other associated tasks.

Home Maker: A person who is primarily responsible for the management and upkeep of the household and does not engage in paid employment or business activities outside the home.

Birth Preparedness and Complication Readiness (BPCR): It is an approach that encourages the timely utilization of skilled maternal and neonatal care, particularly during childbirth. The underlying theory is that by preparing for childbirth and being prepared for any potential complications, delays in accessing necessary care can be minimized.

Key Danger Signs: The danger signs were extracted from ASHAs training curriculum. They were chosen as crucial indicators due to their common occurrence, ease of recognition, and association with potentially severe complications.

Antenatal Care (ANC) Visits: Frequency of visits by mothers during pregnancy to Antenatal clinics expressed in time of visits. The initial visit should take place before 16 weeks of pregnancy, followed by 2^{nd} visit before 28 weeks, the 3^{rd} visit before 32 weeks, and 4^{th} visit after 36 weeks of pregnancy.

Preterm Delivery: Refers to the birth of a baby before completing 37 weeks of gestation, following the period of viability (>28 weeks).

Normal Delivery: Delivery with minimal assistance was classified as a normal delivery.

Caesarean Section Delivery: Delivery performed through a surgical procedure and recorded as C/S or LSCS was categorized as a caesarean section delivery.

IFA Tablet Consumption: This indicates the quantity of IFA (Iron and Folic Acid) tablets taken while pregnant.

Birth Weight: Recorded within 1 hour of birth. The undressed newborn is to be placed on a clean cloth on weighing scale and weighed according to standard method for weight measurement. Data was collected from Mothers.

Low Birth Weight: Baby's weight being <2500 grams at birth, according to WHO.

Commencement of Breastfeeding: Starting breastfeeding to the newborn within an hour after birth.

Exclusive Breastfeeding: Feeding the child only with breast milk till 6 months of age

Primary Health Centre (PHC): It serves as fundamental and operational unit of public health services, offering easily accessible, affordable, and readily available primary healthcare to the population.

Community Health Centre (CHC): It is a government-run consumer-directed healthcare organization that delivers top-notch, affordable, and all-encompassing primary and preventive medical, mental, and dental healthcare services. It operates as the initial point of referral for the community.

Kangaroo Mother Care (KMC): It is an intervention to care for premature or LBW babies which promotes skin to skin contact.

Acceptability: Assessing level of acceptance of an intervention among the target population and evaluating how well the new intervention or its components align with needs of target population and the organizational context.

Feasibility: It is the operational efficacy of certain procedures, logistic support, manpower and material resources. It is the practicality of a proposed plan or project to analyze viability and success of a project, identify potential issues and problems which arise during implementation of the projects.

Research Overview

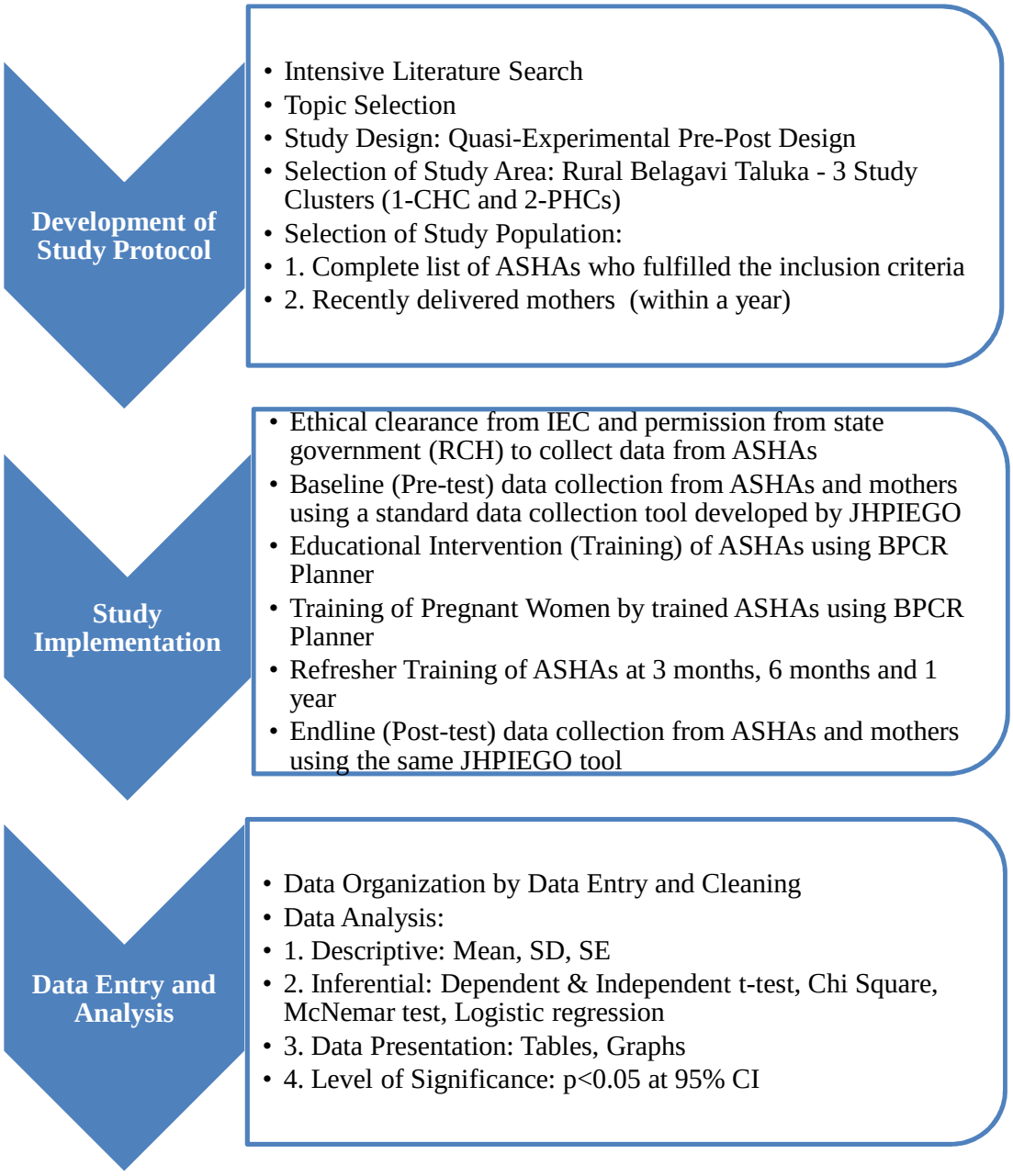


Figure No – 7. Birth Planner – A pictorial pamphlet

Birth Preparedness and Complication Readiness Plan

Mother's Name: _____

D. O. B: _____ Age: _____

LMP: _____ EDD: _____

Contact Number: _____

Husband's contact no.: _____

Obstetric History: G P A D

Blood Group	HIV1/HIV2	TT1/TT2	HbsAg	VDRL

ANC Visits:	ANC_1	ANC_2	ANC_3	ANC_4
Date of visit				
Gestational age				
Weight				
BP				
Hb				
Urine albumin				
Oedema				
Risk Factors				

Birth Preparedness Plan

	Contact no. 1	Contact no. 2	Contact no. 3
Nearest Health care service provider	Name: Mb no:		
Nearest Emergency referral	Name: Mb no.:		
Transportation	Name: Mb No.:		
Funds	Name: Mb no.:		
Birth companion	Name: Mb no.:		
Blood donor	Name: Mb no.:		

AWW's Name: _____

Contact Number: _____

ASHA's Name: _____

Contact Number: _____

Complication Readiness Plan

	Complications	What is to be done?
	Vaginal bleeding: Early in pregnancy, spotting can indicate an implantation bleed. First trimester bleeds may indicate an ectopic pregnancy or miscarriage. Later in pregnancy bleeding can be due to miscarriage, placenta previa or abruption of the placenta. Infections may also cause bleeding.	• If there is any bleeding then you should be examined by your doctor so rush to the hospital. • Do not place any cloth inside the birth canal. • Family or friend should be prepared to donate blood.
	Swelling of hands and face: Swelling of hands and face is seen in case of high blood pressure (BP), eclampsia and pre-eclampsia.	• Rush to the hospital. • You may require admission.
	Severe headache and blurred vision: This can indicate high blood pressure (BP), eclampsia and pre-eclampsia.	• Call the ambulance immediately. • Lie down and take rest. • Apply cold or heat packs to your head until help arrives.
	Fits: Seizures are seen in case of head injury, brain tumor, previoushistory of epilepsy, stroke, hypoglycemia and eclampsia.	• Call for help: transport, money and helpers. • Immediately make the woman lie down on her left side with a pillow under her head. • Clear the airways. • Keep a clean cloth ball in her mouth to avoid tongue bite.
	Severe abdominal pain: Ectopic pregnancy, miscarriage, antepartum hemorrhage may be the cause for abdominal pain.	• Sit down, put your feet up and relax. • Place a heating pad or a hot water bag on the abdomen to relieve pain. • If the pain persists contact your healthcare provider.
	High fever: If body temperature rises above 100°C it indicates an infection.	• Place a cool damp cloth on your forehead. • Take lots of fluids. • Rush to the hospital if fever does not subside.
	Difficulty in breathing: If the pregnant woman experiences shortness of breath or rapid breathing it may be a sign of severe anemia, high fever or asthma.	• Keep your room well-ventilated. • Keep your back and shouldersstraight. • If breathlessness is during sleep, prop yourself up with more pillows. • If the condition worsens seek for health care immediately.
	Reduced/accelerated foetal movements: This may indicate that the baby is in distress. Count how long it takes for your baby to do 10 kicks. This should be less than 2 hours. If you notice a dramatic decrease in the number of kicks, or it takes longer than two hours to perform 10 kicks, get yourself examined by your doctor	• Calm yourself. • Rush to hospital. • Do not do any abdominal massage or push the baby down.

RESULTS OF ASHA DATA ANALYSIS

Table No - 1: Socio-Demographic profile of respondents (ASHAs) (n=100)

Demographic profile	No. of respondents	% of respondents
Age groups		
< 30 years	9	9.00
30-39 years	64	64.00
>=40years	27	27.00
Marital status		
Married	86	86.00
Divorced/separated	14	14.00
Religions		
Hindu	98	98.00
Muslims	2	2.00
Levels of education		
Primary	18	18.00
Secondary	69	69.00
Undergraduate	13	13.00
Levels of education of husband		
Illiterate	13	13.00
Primary	23	23.00
Secondary	44	44.00
Undergraduate	16	16.00
Graduate	4	4.00
Occupations of husband (National Classification of Occupation)		
Service Worker	34	34.00
Skilled Worker	13	13.00
Agricultural Worker	12	12.00
Self Employed	20	20.00
Elementary-Unskilled Labourer	21	21.00

Socioeconomic Status: B.G. Prasad classification (2019)		
I - Upper class (Rs.7008 & above)	0	0.00
II - Upper middle class (Rs.3504-7007)	8	8.00
III - Middle class (Rs.2102-3503)	23	23.00
IV - Lower middle class (Rs.1051-2101)	40	40.00
V - Lower class (Rs.1050 & below)	29	29.00
Family belongs to		
APL	24	24.00
BPL	76	76.00
Types of family		
Nuclear	53	53.00
Joint	47	47.00
Total No. of Family Members		
<=5	59	59.00
>5	41	41.00
Experience		
6–12 months	9	9.00
13-24months	7	7.00
25–36 months	6	6.00
>=37months	78	78.00
Training received		
<=4times	45	45.00
>4 times	55	55.00
Received any training in last 3 months		
No	61	61.00
Yes	39	39.00
Total	**100**	**100.00**

Table No -1: More than half (64%) of the ASHA workers were in the age group of 30-39 years. Around 27% were in the age group of >=40years and only 9% were in the age group of < 30 years. Most (86%) of them were married and rest (14%) of them were either separated or divorced. Most (98%) of them were Hindus and only

2% were Muslims. Majority (69%) of them had secondary level of education whereas 18% of them had primary level of education and only 13% had undergraduate education. Around half of the ASHA workers' husbands had secondary level of education, 23% primary level, 16% undergraduate level, 13% illiterates and only 4% were graduates. Around 34% of the ASHA workers' husbands were service workers, 20% self-employed, 21% elementary-unskilled labourers, 13% skilled workers and 12% agricultural workers. Forty percent (40%) of the participants belonged to lower middle class, 29% lower class and 23% middle class. Around 76% of the families had BPL ration card and rest (24%) had APL ration card. Around (53%) of ASHAs belonged to nuclear families and 47% belonged to joint families. Around 59% of families had <=5 members at home and 41% had >5 members. Most (78%) of the ASHAs had >=37months of experience, 9% had 6–12 months, 7% had 13-24 months, and 6% had 25–36 months of experience. Fifty five percent (55%) of ASHAs received >4 times training and 45% of them received <=4times. Around 61% ASHAs did not receive any training in last 3 months whereas 39% received some training in last 3 months.

Table No - 2: Distribution of ASHAs according to Levels of Knowledge and Practice Scores of BPCR (n=100)

Variable		Low n (%)	Moderate n (%)	High n (%)
Knowledge of Pregnancy Danger Signs	Pre-test	14 (14)	73 (73)	13 (13)
	Post-test	0 (0)	4 (4)	96 (96)
Knowledge of ANC	Pre-test	5 (5)	94 (94)	1 (1)
	Post-test	0 (0)	0 (0)	100 (100)
Knowledge of Info given to Pregnant women	Pre-test	11 (11)	82 (82)	7 (7)
	Post-test	0 (0)	0 (0)	100 (100)
Knowledge of Labour & Childbirth Danger Signs	Pre-test	19 (19)	67 (67)	14 (14)
	Post-test	0 (0)	9 (9)	91 (91)
Knowledge of Birth Preparedness	Pre-test	16 (16)	69 (69)	15 (15)
	Post-test	0 (0)	0 (0)	100 (100)
Knowledge of Postpartum Danger Signs	Pre-test	11 (11)	75 (75)	14 (14)
	Post-test	0 (0)	6 (6)	94 (94)
Knowledge of postpartum care for mothers	Pre-test	14 (14)	78 (78)	8 (8)
	Post-test	0 (0)	0 (0)	100 (100)
Knowledge of Baby care after birth	Pre-test	0 (0)	75 (75)	25 (25)
	Post-test	0 (0)	0 (0)	100 (100)
Knowledge of Breastfeeding	Pre-test	24 (24)	64 (64)	12 (12)
	Post-test	0 (0)	18 (18)	82 (82)
Practice of ANC Services	Pre-test	12 (12)	88 (88)	0 (0)
	Post-test	0 (0)	6 (6)	94 (94)
Practice of Birth Preparedness Services	Pre-test	10 (10)	66 (66)	24 (24)
	Post-test	0 (0)	0 (0)	100 (100)

Table No – 2: Levels of Knowledge and Practice Scores of BPCR among ASHAs: Knowledge towards Pregnancy danger signs, Labor and childbirth danger signs, Postpartum danger signs and Birth preparedness had multiple options. Each of these options was assigned a score of 1. Equal weightage was given to each option. Answered option carried – '1' score and unanswered option carried - '0' score. All other questions from the questionnaire were assigned in a similar manner (Yes-1, No-0).

Levels of knowledge and practice were calculated by adding all scores and converting them into percentages for each participant. Mean and Standard Deviation (SD) were calculated, then they were categorized as follows:

Low Level: Scores **Below Mean-SD**
Moderate Level: Scores **Equal to Mean±SD**
High Level: Scores **Above Mean+SD**

Before training (Pre-test) ASHAs had low and moderate knowledge and practice of Pregnancy danger signs, Labor and childbirth danger signs, Postpartum danger signs and Birth preparedness but after training (Post-test) the knowledge and practice increased significantly to high levels.

Table No – 3: Summary of Pre-test and Post-test knowledge scores of Pregnancy Danger Signs (n=100)

Knowledge of	Time point	Mean	SD	95% CI for mean	
				Lower	Upper
Pregnancy key danger signs	Pretest	28.33	22.41	23.89	32.78
	Posttest	92.33	14.87	89.38	95.28
Pregnancy other danger signs	Pretest	23.45	11.42	21.19	25.72
	Posttest	66.38	16.06	63.19	69.56
Total danger signs	Pretest	31.55	15.80	28.41	34.68
	Posttest	73.45	12.64	70.95	75.96

Table No – 3: Pre-test mean score of pregnancy key danger signs was 28.33% with a SD of 22.41 whereas Post-test mean score was 92.33±14.87. Pre-test mean score of pregnancy other danger signs was 23.45% whereas post-test mean score increased to 66.38%. Total pregnancy danger sign pre-test knowledge mean score was 31.55±15.80 which increased after intervention to 73.45±12.64 (post-test).

Table No - 4: Comparison of Pre-test and Post-test knowledge scores of Pregnancy Danger Signs (n=100)

Knowledge of Pregnancy key danger signs	Time point	Mean	SD	Mean Diff.	SD Diff.	t-value	p-value
	Pretest	28.33	22.41				
	Posttest	92.33	14.87	64.00	27.50	23.2765	**<0.001**
Pregnancy other danger signs	Pretest	32.25	15.71				
	Posttest	66.38	16.06	34.13	22.46	15.1916	**<0.001**
Total danger signs	Pretest	31.55	15.80				
	Posttest	73.45	12.64	41.91	20.43	20.5175	**<0.001**

Table No - 4: Dependent t-test was used to compare the pregnancy danger sign knowledge scores of pre-test and post-test which showed a significant increase in the knowledge score of post-test with a p-value of <0.001 at 95% CI.

Figure No - 8: Comparison of Pre-test and Post-test knowledge scores of Pregnancy Danger Signs

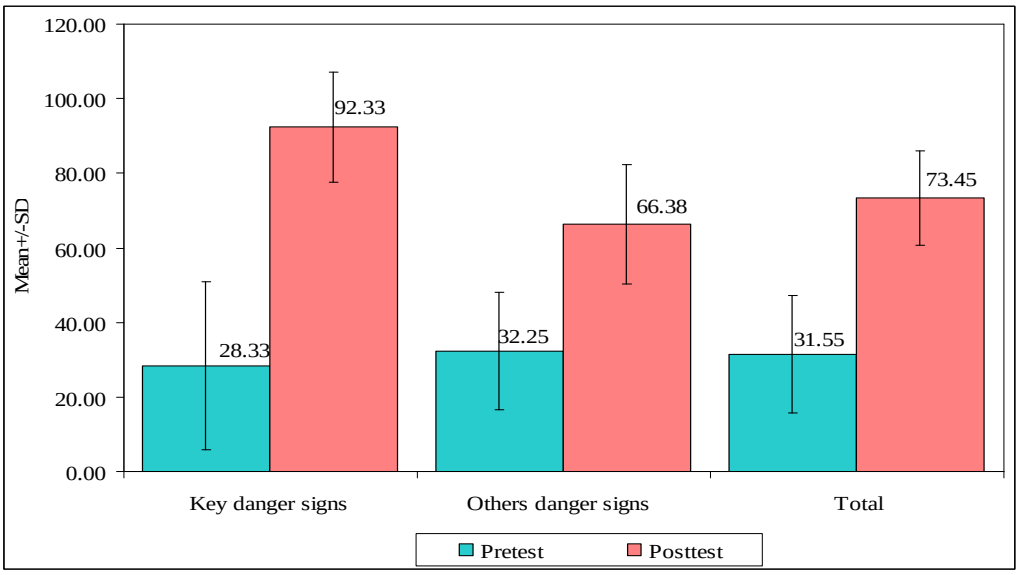


Table No - 5: Levels of knowledge scores of Pregnancy Danger Signs (n=100)

Levels of knowledge	Pretest		Posttest		Mc Nemar test
	No	%	No	%	
Key danger signs					
Low level (<=50%)	86	86.00	1	1.00	
High level (>50%)	14	14.00	99	99.00	**P<0.001**
Other danger signs					
Low level (<=50%)	93	93.00	25	25.00	
High level (>50%)	7	7.00	75	75.00	**P<0.001**
Total danger signs					
Low level (<=50%)	87	87.00	4	4.00	
High level (>50%)	13	13.00	96	96.00	**P<0.001**
Total	100	100.00	100	100.00	

Table No - 5: Pregnancy danger signs knowledge scores were divided into Low level (<=50%) and High level (>50%) for both pre-test & post-test. Mc Nemar test showed a significant increase in high level (>50%) knowledge score of post-test with a p-value of <0.001 at 95% CI.

Table No - 6: Association between levels of Pre-test knowledge of Pregnancy danger signs with demographic profile of respondents by Chi-Square (χ^2) Test (n=100)

Demographic profile	Levels of pretest knowledge towards total danger signs					χ^2	p-value
	Low level	%	High level	%	Total		
Age groups							
< 30 years	9	10.34	0	0.00	9	2.0860	0.3520
30-39 years	56	64.37	8	61.54	64		
>=40years	22	25.29	5	38.46	27		
Marital status							
Married	74	85.06	12	92.31	86	0.4940	0.4820
Divorced/separated	13	14.94	1	7.69	14		
Religions							
Hindu	85	97.70	13	100.00	98	0.3050	0.5810
Muslims	2	2.30	0	0.00	2		
Levels of education							
Primary	17	19.54	1	7.69	18	2.0490	0.3590
Secondary	60	68.97	9	69.23	69		
Undergraduate	10	11.49	3	3.00	13		
Family belongs to							
BPL	65	74.71	11	84.62	76	0.6080	0.4360
APL	22	25.29	2	15.38	24		

Types of family							
Nuclear	47	54.02	6	46.15	53	0.2810	0.5960
Joint	40	45.98	7	53.85	47		
Total No. of Family Members							
<=5	52	59.77	7	53.85	59	0.1640	0.6850
>5	35	40.23	6	46.15	41		
Experience							
6–12 months	8	9.20	1	7.69	9	2.3630	0.5010
13-24months	7	8.05	0	0.00	7		
25–36 months	6	6.90	0	0.00	6		
>=37months	66	75.86	12	92.31	78		
Training received							
<=4times	40	45.98	5	38.46	45	0.2580	0.6110
>4 times	47	54.02	8	61.54	55		
Received any training in last 3 months							
No	53	60.92	8	61.54	61	0.0020	0.9660
Yes	34	39.08	5	38.46	39		
Total	87	100.00	13	100.00	100		

Table No - 6: Chi-Square (χ^2) test showed No significant association between levels of pre-test pregnancy danger sign knowledge and demographic profile of respondents.

Table No - 7: Association between levels of Post-test knowledge of Pregnancy Danger Signs with demographic profile of respondents by Chi-Square (χ^2) Test (n=100)

Demographic profile	Levels of posttest knowledge towards total danger signs					χ^2	p-value
	Low level	%	High level	%	Total		
Age groups							
< 30 years	0	0.00	9	9.38	9	1.3190	0.5170
30-39 years	2	50.00	62	64.58	64		
>=40years	2	50.00	25	26.04	27		
Marital status							
Married	3	75.00	83	86.46	86	0.4190	0.5180
Divorced/separated	1	25.00	13	13.54	14		
Religions							
Hindu	3	75.00	95	98.96	98	11.2460	**0.0010***
Muslims	1	25.00	1	1.04	2		
Levels of education							
Primary	2	50.00	16	16.67	18	4.0010	0.1350
Secondary	1	25.00	68	70.83	69		
Undergraduate	1	25.00	12	12.00	13		
Family belongs to							
BPL	2	50.00	74	77.08	76	1.5440	0.2140
APL	2	50.00	22	22.92	24		

Types of family							
Nuclear	2	50.00	51	53.13	53	0.0150	0.9020
Joint	2	50.00	45	46.88	47		
Total No. of Family Members							
<=5	2	50.00	57	59.38	59	0.1400	0.7090
>5	2	50.00	39	40.63	41		
Experience							
6–12 months	1	25.00	8	8.33	9	1.7320	0.6300
13-24months	0	0.00	7	7.29	7		
25–36 months	0	0.00	6	6.25	6		
>=37months	3	75.00	75	78.13	78		
Training received							
<=4times	3	75.00	42	43.75	45	1.5150	0.2180
>4 times	1	25.00	54	56.25	55		
Received any training in last 3 months							
No	4	100.00	57	59.38	61	2.6640	0.1030
Yes	0	0.00	39	40.63	39		
Total	4	100.00	96	100.00	100		

*p<0.05

Table No - 7: Chi-Square (χ^2) test showed no significant association between levels of post-test pregnancy danger sign knowledge and demographic profile of respondents except in religion. Hindu respondents had high level of post-test score compared to Muslim respondents. That might be because there were only 2 Muslim respondents.

Table No - 8: Summary of Pre-test and Post-test knowledge scores of ANC (n=100)

Knowledge of	Time point	Mean	SD	95% CI for mean	
				Lower	Upper
ANC	Pre-test	71.25	7.04	69.85	72.65
	Post-test	99.00	3.80	98.25	99.75

Table No - 8: The mean pre-test score of ANC was 71.25±7.04 and post-test knowledge scores (%) of ANC was 99±3.80.

Table No - 9: Comparison of Pre-test and Post-test knowledge scores of ANC (n=100)

Knowledge of	Time point	Mean	SD	Mean Diff.	SD Diff.	t-value	p-value
ANC	Pretest	71.25	7.04				
	Posttest	99.00	3.80	27.75	8.30	33.4507	**<0.001**

Table no - 9: Comparison of Pre-test and Post-test knowledge scores (%) of ANC by Dependent t-test showed that there was a significant difference between pre- test and post-test knowledge scores of ANC with a p-value of <0.001 at 95% CI.

Figure No - 9: Comparison of Pre-test and Post-test knowledge scores of ANC

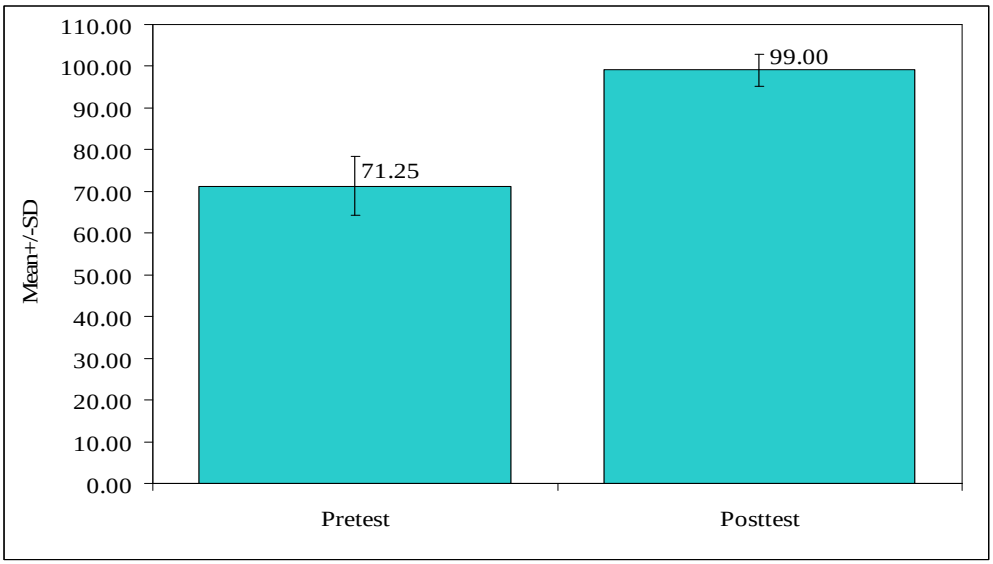


Table No - 10: Levels of knowledge scores of ANC (n=100)

Levels of knowledge of **ANC**	Pretest		Posttest		Mc Nemar Test
	No	%	No	%	
Low level (<=50%)	5	5.00	0	0.00	
High level (>50%)	95	95.00	100	100.00	**P<0.001**
Total	100	100.00	100	100.00	

Table No - 10: Level of knowledge scores of ANC were divided into low level (<=50%) and high level (>50%) for both pre-test & post-test. There was a significant increase in the high level (>50%) knowledge score of post-test with a p-value of <0.001 at 95% CI according to Mc Nemar Test.

Table no - 11: Association between levels of Pre-test knowledge of ANC with demographic profile of respondents by Chi-Square (χ^2) Test (n=100)

Demographic profile	Levels of pretest knowledge of ANC					χ^2	p-value
	Low level	%	High level	%	Total		
Age groups							
< 30 years	0	0.00	9	9.47	9	0.8160	0.6650
30-39 years	5	100.00	59	62.11	64		
>=40years	0	0.00	27	28.42	27		
Marital status							
Married	3	60.00	83	87.37	86	0.8570	0.3550
Divorced/separated	2	40.00	12	12.63	14		
Religions							
Hindu	5	100.00	93	97.89	98	0.1070	0.7430
Muslims	0	0.00	2	2.11	2		
Levels of education							
Primary	0	0.00	18	18.95	18	1.2380	0.5380
Secondary	5	100.00	64	67.37	69		
Undergraduate	0	0.00	13	13.68	13		
Family belongs to							
BPL	3	60.00	73	76.84	76	1.6620	0.1970
APL	2	40.00	22	23.16	24		
Types of family							
Nuclear	4	80.00	49	51.58	53	4.6670	**0.0310***
Joint	1	20.00	46	48.42	47		

Total No. of Family Members							
<=5	4	80.00	55	57.89	59	3.6570	0.0560
>5	1	20.00	40	42.11	41		
Experience							
6–12 months	2	40.00	7	7.37	9		
13-24months	1	20.00	6	6.32	7	3.6820	0.2980
25–36 months	1	20.00	5	5.26	6		
>=37months	1	20.00	77	81.05	78		
Training received							
<=4times	5	100.00	40	42.11	45	0.0530	0.8180
>4 times	0	0.00	55	57.89	55		
Received any training in last 3 months							
No	4	80.00	57	60.00	61		
Yes	1	20.00	38	40.00	39	0.7990	0.3710
Total	5	100.00	95	100.00	100		

*p<0.05

Table No - 11: Chi-Square (χ^2) test showed a significant association between levels of pre-test knowledge of ANC and type of family. Respondents living in joint family had high pre-test knowledge scores compared to those from nuclear family with a p-value of 0.0310 at 95% CI.

Table No - 12: Distribution of ASHAs according to Pre-test and Post-test Knowledge of Information given to Pregnant Women (n=100)

ASHA's Knowledge of information given to Pregnant Women	Pre-test (n=100)		Post-test (n=100)	
	Yes	No	Yes	No
	n (%)	n (%)	n (%)	n (%)
All the pregnant women are at risk of developing pregnancy related complications	7 (7)	93 (93)	100 (100)	0 (0)
Maternal complications are unpredictable but are treatable	6 (6)	94 (94)	86 (86)	14 (14)
Importance and components of ANC visits	100 (100)	0 (0)	100 (100)	0 (0)
Signs and symptoms of complications during pregnancy, childbirth and postpartum period	11 (11)	89 (89)	79 (79)	21 (21)
Birth preparedness plan	11 (11)	89 (89)	100 (100)	0 (0)
Family planning (contraceptive) methods	8 (8)	92 (92)	99 (99)	1 (1)
Nutrition & hygiene education	69 (69)	31 (31)	91 (91)	9 (9)

Table no - 13: Summary of Pre-test and Post-test knowledge scores of information given to pregnant women (n=100)

Knowledge of	Time point	Mean	SD	95% CI for mean	
				Lower	Upper
Information given to pregnant women	Pre-test	48.73	9.09	46.92	50.53
	Post-test	97.82	4.68	96.89	98.75

Table No - 13: The mean pre-test score of information given to pregnant women was 48.73±9.09 and post-test knowledge score of information given to pregnant women was 97.82±4.68.

Table No - 14: Comparison of Pre-test and Post-test knowledge scores of information given to pregnant women (n=100)

Knowledge of	Time point	Mean	SD	Mean Diff.	SD Diff.	t-value	p-value
Info given to pregnant women	Pretest	48.73	9.09				**<0.001**
	Posttest	97.82	4.68	49.09	10.66	46.0725	

Table No - 14: Comparison of pre-test and post-test knowledge scores (%) of information given to pregnant women by Dependent t-test showed that there was a significant difference between pre-test and post-test knowledge scores of information given to pregnant women with a p-value of <0.001 at 95% CI.

Figure No - 10: Comparison of Pre-test and Post-test knowledge scores (%) of information given to pregnant women

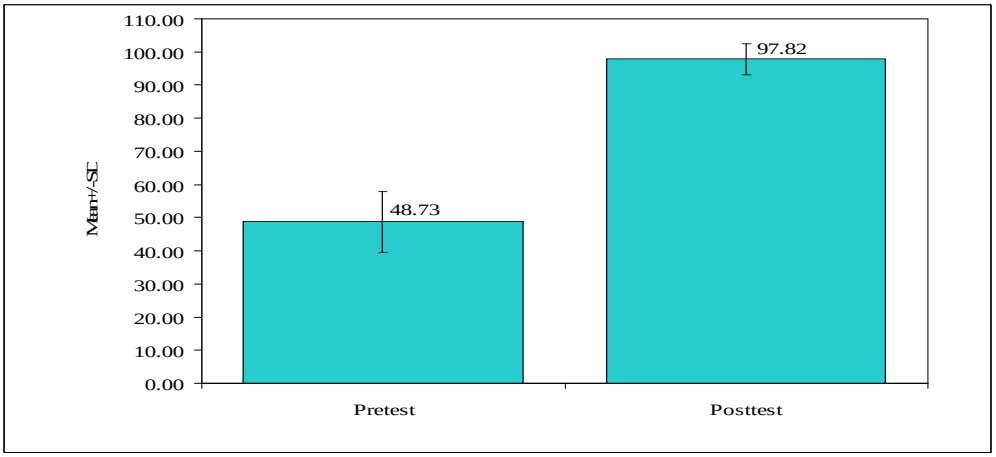


Table No - 15: Levels of knowledge scores of information given to pregnant women (n=100)

Levels of knowledge of information given to pregnant women	Pre-test		Post-test		Mc Nemar Test
	No	%	No	%	
Low level (<=50%)	67	67.00	0	0.00	**P<0.001**
High level (>50%)	33	33.00	100	100.00	
Total	100	100.00	100	100.00	

Table No - 15: Mc Nemar test showed a significant increase in the high level (>50%) knowledge score of information given to pregnant women in post-test (from 33 to 100%) with a p-value of <0.001 at 95% CI.

Table No - 16: Summary of Pre-test and Post-test knowledge scores of Labor & Childbirth Danger Signs (n=100)

Knowledge of	Time point	Mean	SD	95% CI for mean	
				Lower	Upper
Labor & Childbirth Key danger signs	Pretest	34.25	19.35	30.41	38.09
	Posttest	68.75	17.90	65.20	72.30
Labor & Childbirth other danger signs	Pretest	21.40	14.57	18.51	24.29
	Posttest	40.80	14.47	37.93	43.67
Total danger signs	Pretest	27.11	12.86	24.56	29.66
	Posttest	53.22	10.39	51.16	55.28

Table No - 16: The mean pre-test score of labor & childbirth key danger signs was 34.25±19.35 and post-test knowledge was 68.75±17.90. The mean pre-test score of labor & childbirth other danger signs was 21.40±14.57 and post-test knowledge score was 40.80±14.47. Mean pre-test score for total danger signs of labor & childbirth was 27.11±12.86 and mean post-test score was 53.22±10.39 which increased after intervention.

Table No - 17: Comparison of Pre-test and Post-test knowledge scores of Labor & Childbirth Danger Signs (n=100)

Knowledge of	Time point	Mean	SD	Mean Diff.	SD Diff.	t-value	p-value
Labor & Childbirth Key danger signs	Pretest	34.25	19.35				
	Posttest	68.75	17.90	34.50	27.47	12.5575	**<0.001**
Labor &Childbirth other danger signs	Pretest	21.40	14.57				
	Posttest	40.80	14.47	19.40	19.17	10.1224	**<0.001**
Total danger signs	Pretest	27.11	12.86				
	Posttest	53.22	10.39	26.11	16.13	16.1835	**<0.001**

Table No - 17: Comparison of pre-test and post-test knowledge scores of labor & childbirth key danger signs by Dependent t-test showed that there was a significant difference between pre-test and post-test knowledge scores of labor & childbirth key danger signs, other danger signs and total danger signs with a p-value of <0.001 at 95% CI.

Figure No - 11: Comparison of Pre-test and Post-test knowledge scores of Labor & Childbirth Danger Signs

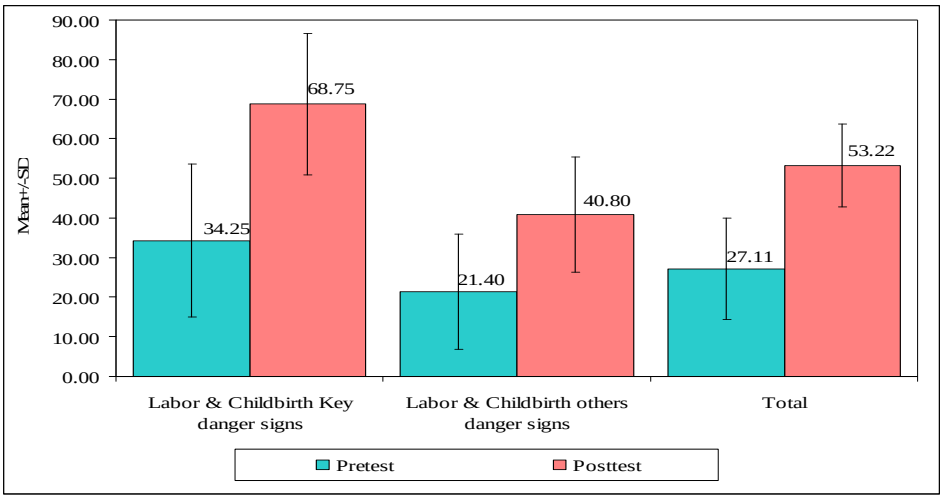


Table No - 18: Levels of knowledge scores towards Labor & Childbirth Danger Signs (n=100)

Levels of knowledge	Pretest		Posttest		Mc Nemar test
	No	%	No	%	
Labor & Childbirth Key danger signs					
Low level (<=50%)	94	94.00	33	33.00	**P<0.001**
High level (>50%)	6	6.00	67	67.00	
Labor & Childbirth other danger signs					
Low level (<=50%)	95	95.00	74	74.00	**P<0.001**
High level (>50%)	5	5.00	26	26.00	
Total Labor & Childbirth danger signs					
Low level (<=50%)	46	46.00	35	35.00	**P<0.001**
High level (>50%)	54	54.00	65	65.00	
Total	100	100.00	100	100.00	

Table No – 18: Level of knowledge scores of labor & childbirth danger signs were divided into low level (<=50%) and high level (>50%) for both pre-test & post-test. Mc Nemar test showed significant increase in the high level (>50%) knowledge score of post-test with a p-value of <0.001 at 95% CI.

Table No – 19: Association between levels of Pre-test knowledge of Labor & Childbirth Danger Signs with demographic profile of respondents by Chi-Square (χ^2) Test (n=100)

Demographic profile	Levels of pretest knowledge towards Labor & Childbirth total danger signs					χ^2	p-value
	Low level	%	High level	%	Total		
Age groups							
< 30 years	4	8.70	5	9.26	9		
30-39 years	29	63.04	35	64.81	64	0.0710	0.9650
>=40years	13	28.26	14	25.93	27		
Marital status							
Married	37	80.43	49	90.74	86	0.0650	0.7990
Divorced/separated	9	19.57	5	9.26	14		
Religions							
Hindu	45	97.83	53	98.15	98	0.0130	0.9090
Muslims	1	2.17	1	1.85	2		
Levels of education							
Primary	10	21.74	8	14.81	18		
Secondary	31	67.39	38	70.37	69	5.8770	0.0530
Undergraduate	5	10.87	8	14.81	13		

Family belongs to							
BPL	32	69.57	44	81.48	76	2.0400	0.1530
APL	14	30.43	10	18.52	24		
Types of family							
Nuclear	24	52.17	29	53.70	53	1.1090	0.2920
Joint	22	47.83	25	46.30	47		
Total No. of Family Members							
<=5	26	56.52	33	61.11	59	0.1230	0.7260
>5	20	43.48	21	38.89	41		
Experience							
6–12 months	6	13.04	3	5.56	9		
13-24months	4	8.70	3	5.56	7	4.8050	0.1870
25–36 months	3	6.52	3	5.56	6		
>=37months	33	71.74	45	83.33	78		
Any training received							
<=4times	24	52.17	21	38.89	45	0.4700	0.4930
>4 times	22	47.83	33	61.11	55		
Received any training in last 3 months							
No	27	58.70	34	62.96	61	0.6370	0.4250
Yes	19	41.30	20	37.04	39		
Total	46	100.00	54	100.00	100		

*p<0.05

Table No - 19: Chi-Square (χ^2) test showed no significant association between levels of pre-test knowledge of Labor & Childbirth danger signs and demographic profile of respondents.

Table No - 20: Multiple logistic regression analysis of high level of Pre-test knowledge of Labor & Childbirth Danger Signs by demographic profile (n=100)

Demographic profile	Adjusted OR	95% CI for odds ratio		p-value
		Lower	Upper	
Age groups				
< 30 years	Ref.			
30-39 years	0.70	0.09	5.20	0.7240
>=40years	0.93	0.09	9.40	0.9540
Religions				
Hindu	Ref.			
Muslims	2.36	0.07	86.09	0.6390
Levels of education				
Primary	Ref.			
Secondary	0.05	0.00	0.58	**0.0160***
Undergraduate	0.24	0.04	1.53	0.1300
Family belongs to				
APL	Ref.			
BPL	6.30	1.20	33.24	**0.0300***
Types of family				
Nuclear	Ref.			
Joint	0.67	0.13	3.33	0.6230

Total No. of Family Members				
<=5	Ref.			
>5	1.60	0.35	7.45	0.5470
Experience				
6–12 months	Ref.			
13-24months	14.65	0.47	458.95	0.1270
25–36 months	0.11	0.00	2.79	0.1800
>=37months	1.96	0.23	16.65	0.5370
Training received				
<=4times	Ref.			
>4 times	0.42	0.12	1.40	0.1560
Received any training in last 3 months				
No	Ref.			
Yes	1.27	0.44	3.67	0.6600

Table No - 20: Multiple logistic regression analysis showed that respondents with secondary level of education and belonging to BPL families had high level knowledge of Labor & Childbirth danger signs and it is statistically significant with p-value of 0.0160 & 0.0300 at 95% CI.

Table No - 21: Summary of Pre-test and Post-test knowledge scores of Birth Preparedness (n=100)

Knowledge of Birth Preparedness	Time point	Mean	SD	95% CI for mean	
				Lower	Upper
	Pretest	44.50	14.25	41.67	47.33
	Posttest	87.88	2.78	87.32	88.43

Table No - 21: The mean Pre-test score of Birth Preparedness was 44.50±14.25 and Post-test knowledge score was 87.88±2.78 which increased after training.

Table No - 22: Comparison of Pre-test and Post-test knowledge scores of Birth Preparedness (n=100)

Knowledge of	Time point	Mean	SD	Mean Diff.	SD Diff.	t-value	p-value
Birth Preparedness	Pretest	44.50	14.25				
	Posttest	87.88	2.78	43.38	14.70	29.5073	**<0.001**

Table No - 22: Comparison of Pre-test and Post-test knowledge scores of Birth Preparedness by Dependent t-test showed that there was a significant difference between pre- test and post-test knowledge scores towards Birth Preparedness with a p-value of <0.001 at 95%CI.

Figure No - 12: Comparison of Pre-test and Post-test knowledge scores of Birth Preparedness

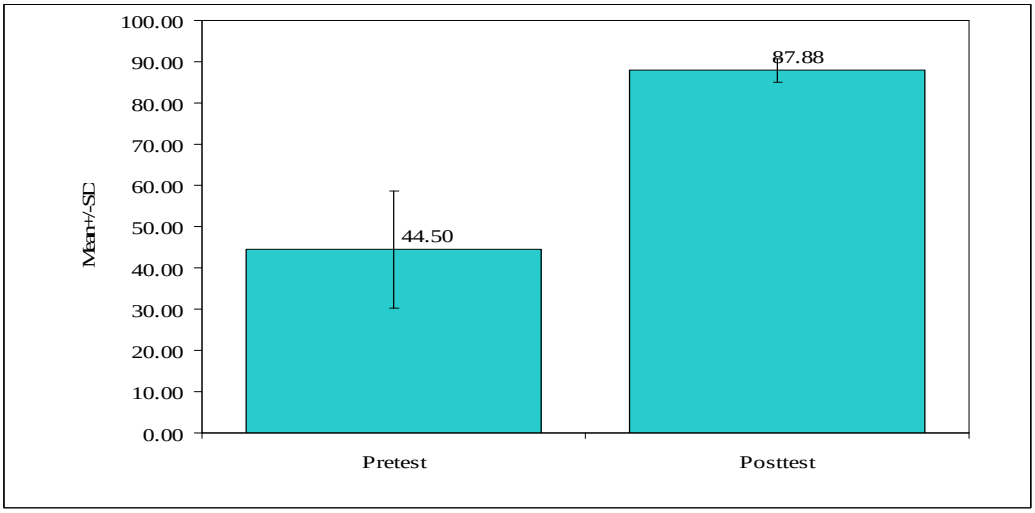


Table No - 23: Levels of knowledge scores of Birth Preparedness (n=100)

Levels of knowledge to wards Birth Preparedness	Pretest		Posttest		Mc Nemar test
	No	%	No	%	
Low level (<=50%)	85	85.00	33	33.00	**P<0.001**
High level (>50%)	15	15.00	67	67.00	
Total	100	100.00	100	100.00	

Table No - 23: Comparison of levels of knowledge scores of birth preparedness by Mc Nemar test showed a significant increase in the high level (>50%) knowledge score (from 15 to 67) of post-test with a p-value of <0.001 at 95% CI.

Table No - 24: Association between levels of Pre-test knowledge of Birth Preparedness with demographic profile of respondents by Chi-Square (χ^2) Test (n=100)

Demographic profile	Levels of pretest knowledge towards Birth Preparedness					χ^2	p-value
	Low level	%	High level	%	Total		
Age groups							
< 30 years	7	8.24	2	13.33	9	0.9440	0.6240
30-39 years	57	67.06	7	46.67	64		
>=40years	21	24.71	6	40.00	27		
Marital status							
Married	73	85.88	13	86.67	86	0.7880	0.3750
Divorced/separated	12	14.12	2	13.33	14		
Religions							
Hindu	84	98.82	14	93.33	98	0.3600	0.5480
Muslims	1	1.18	1	6.67	2		
Levels of education							
Primary	16	18.82	2	13.33	18	0.9450	0.6230
Secondary	57	67.06	12	80.00	69		
Undergraduate	12	14.12	1	6.67	13		
Family belongs to							
BPL	63	74.12	13	86.67	76	0.0690	0.7930
APL	22	25.88	2	13.33	24		
Types of family							
Nuclear	45	52.94	8	53.33	53	1.1970	0.2740
Joint	40	47.06	7	46.67	47		

Total No. of Family Members							
<=5	50	58.82	9	60.00	59	1.1100	0.2920
>5	35	41.18	6	40.00	41		
Experience							
6–12 months	9	10.59	0	0.00	9	3.4830	0.3230
13-24months	6	7.06	1	6.67	7		
25–36 months	6	7.06	0	0.00	6		
>=37months	64	75.29	14	93.33	78		
Any training received							
<=4times	40	47.06	5	33.33	45	1.6040	0.2050
>4 times	45	52.94	10	66.67	55		
Received any training in last 3 months							
No	52	61.18	9	60.00	61	0.2380	0.6260
Yes	33	38.82	6	40.00	39		
Total	85	100.00	15	100.00	100		

*p<0.05

Table No - 24: Chi-Square (χ^2) test revealed no significant association between levels of pre-test knowledge of birth preparedness and demographic profile of respondents.

Table No - 25: Summary of Pre-test and Post-test knowledge scores of Postpartum Danger Signs (n=100)

Knowledge of	Time point	Mean	SD	95% CI for mean	
				Lower	Upper
Postpartum Key danger signs	Pretest	44.67	20.77	40.55	48.79
	Posttest	57.67	18.87	53.92	61.41
Postpartum other danger signs	Pretest	18.44	13.88	15.69	21.20
	Posttest	53.22	12.76	50.69	55.75
Total	Pretest	27.27	14.15	24.46	30.08
	Posttest	59.27	11.95	56.90	61.64

Table No - 25: The mean pre-test score of postpartum key danger signs was 44.67±20.77 and post-test knowledge score was 57.67±18.87. The mean pre-test score of postpartum other danger signs was 18.44±13.88 and post-test knowledge score was 53.22±12.76. Total knowledge pre-test mean score was 27.27±14.15 which increased after intervention to 59.27±11.95 in post-test.

Table No - 26: Comparison of Pre-test and Post-test knowledge scores of Postpartum Danger Signs (n=100)

Knowledge of	Time point	Mean	SD	Mean Diff.	SD Diff.	t-value	p-value
Postpartum Key danger signs	Pretest	44.67	20.77				
	Posttest	57.67	18.87	13.00	25.90	5.0184	**<0.001**
Postpartum other danger signs	Pretest	18.44	13.88				
	Posttest	53.22	12.76	34.78	17.35	20.0481	**<0.001**
Total	Pretest	27.27	14.15				
	Posttest	59.27	11.95	32.00	16.67	19.1939	**<0.001**

Table No - 26: Comparison of pre-test and post-test knowledge scores (%) of postpartum danger signs by Dependent t-test showed that there was a significant difference between pre- test and post-test knowledge scores of postpartum key danger signs, other danger signs and total danger signs with a p-value of <0.001 at 95% CI.

Figure No - 13: Comparison of Pre-test and Post-test knowledge scores of Postpartum Danger Signs

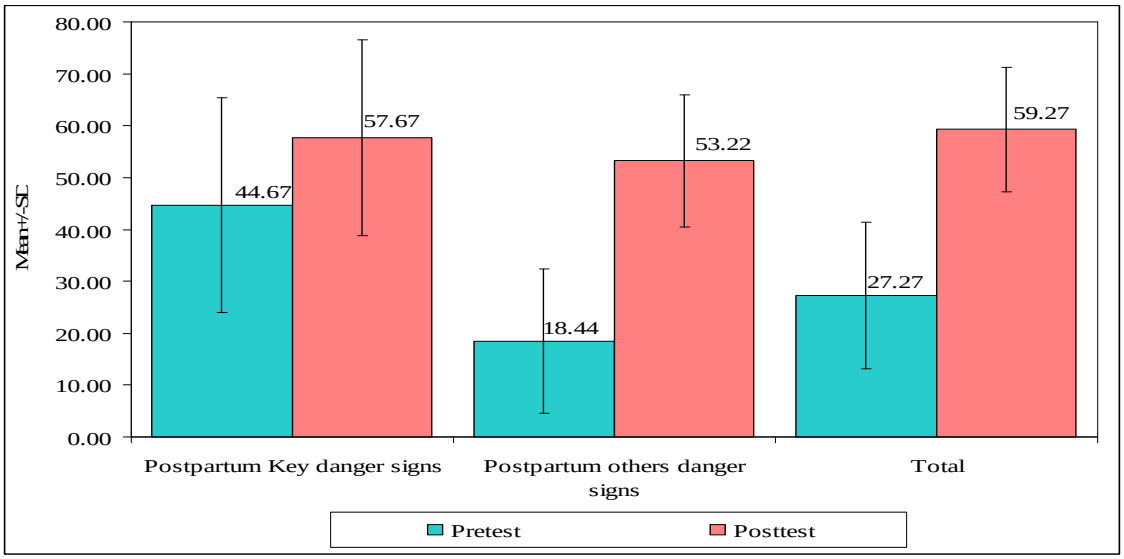


Table No - 27: Levels of knowledge scores of Postpartum Danger Signs (n=100)

Levels of knowledge	Pretest		Posttest		Mc Nemar test
	No	%	No	%	
Postpartum key danger signs					
Low level (<=50%)	66	66.00	33	33.00	**P<0.001**
High level (>50%)	34	34.00	67	67.00	
Postpartum other danger signs					
Low level (<=50%)	96	96.00	39	39.00	**P<0.001**
High level (>50%)	4	4.00	61	61.00	
Total Postpartum danger signs					
Low level (<=50%)	90	90.00	24	24.00	**P<0.001**
High level (>50%)	10	10.00	76	76.00	
Total	100	100.00	100	100.00	

Table No - 27: Level of knowledge scores of postpartum key danger signs, other danger signs and total danger signs were divided into low level (<=50%) and high level (>50%) for both pre-test & post-test. Mc Nemar test showed a significant increase in the high level knowledge scores of post-test with a p-value of <0.001 at 95% CI.

Table No - 28: Summary of Pre-test and Post-test knowledge scores of Postpartum Care (n=100)

Knowledge	Time point	Mean	SD	95% CI for mean	
				Lower	Upper
Postpartum care for mothers	Pretest	30.75	10.72	28.62	32.88
	Posttest	61.13	3.93	60.35	61.90

Table No - 28: The mean Pre-test knowledge score of postpartum care was 30.75±10.72 and Post-test knowledge score increased to 61.13±3.93 after intervention.

Table No - 29: Comparison of Pre-test and Post-test Knowledge scores of Postpartum Care (n=100)

Knowledge towards	Time point	Mean	SD	Mean Diff.	SD Diff.	t-value	p-value
Postpartum care for mothers	Pretest	30.75	10.72				
	Posttest	61.13	3.93	30.38	11.82	25.6997	**<0.001**

Table No - 29: Comparison of pre-test and post-test knowledge scores (%) towards Postpartum Care by Dependent t-test showed that there was a significant difference between pre-test and post-test knowledge scores of postpartum care with a p-value of <0.001 at 95% CI.

Figure No - 14: Comparison of Pre-test and Post-test knowledge scores of Postpartum Care

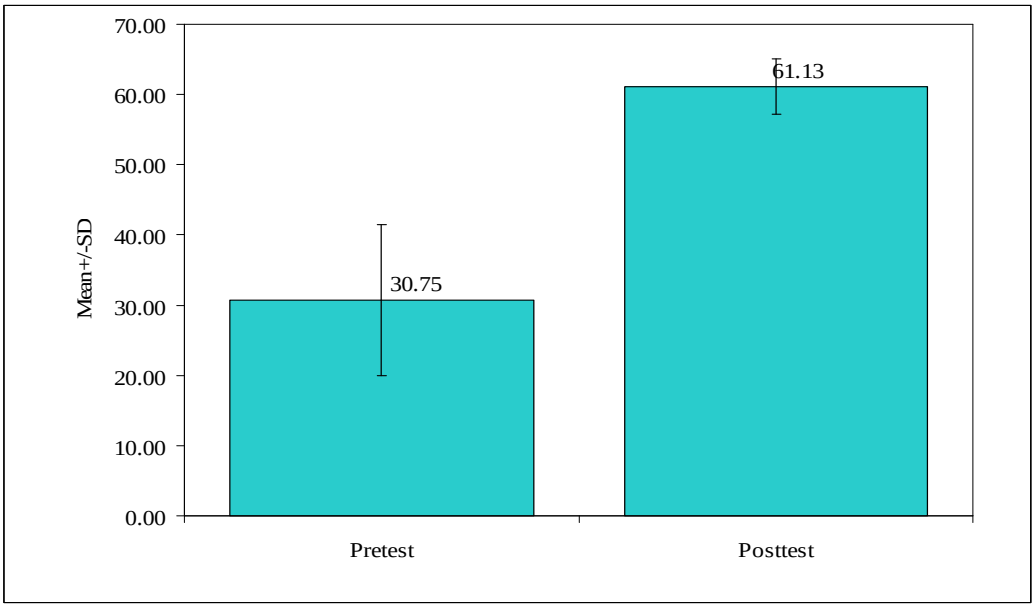


Table No - 30: Levels of Knowledge scores of Postpartum Care (n=100)

Levels of knowledge **Postpartum care for mothers**	Pretest		Posttest		Mc Nemar test
	No	%	No	%	
Low level (<=50%)	100	100.00	11	11.00	**P<0.001**
High level (>50%)	0	0.00	89	89.00	
Total	100	100.00	100	100.00	

Table No - 30: Mc Nemar test showed that there was a significant increase in the high level (>50%) knowledge score of post-test with a p-value of <0.001 at 95% CI.

Table No - 31: Summary of Pre-test and Post-test Knowledge scores of Baby Care (n=100)

Knowledge	Time point	Mean	SD	95% CI for mean	
				Lower	Upper
Babycare after birth	Pretest	43.50	10.72	25.00	100.00
	Posttest	95.25	3.93	75.00	100.00

Table No - 31: The mean pre-test score towards baby care was 43.50±10.72 which increased after intervention to a post-test knowledge score of 95.25±3.93.

Table No - 32: Comparison of Pre-test and Post-test Knowledge scores of Baby Care (n=100)

Knowledge	Time point	Mean	SD	Mean Diff.	SD Diff.	t-value	p-value
Baby care after birth	Pretest	43.50	22.08				
	Posttest	95.25	9.86	51.75	23.90	21.6491	**<0.001**

Table No - 32: Comparison of pre-test and post-test knowledge scores of baby care by Dependent t-test showed that there was a significant difference between pre-test and post-test knowledge scores of baby care with a p-value of <0.001 at 95% CI.

Figure No - 15: Comparison of Pre-test and Post-test knowledge scores of Baby Care

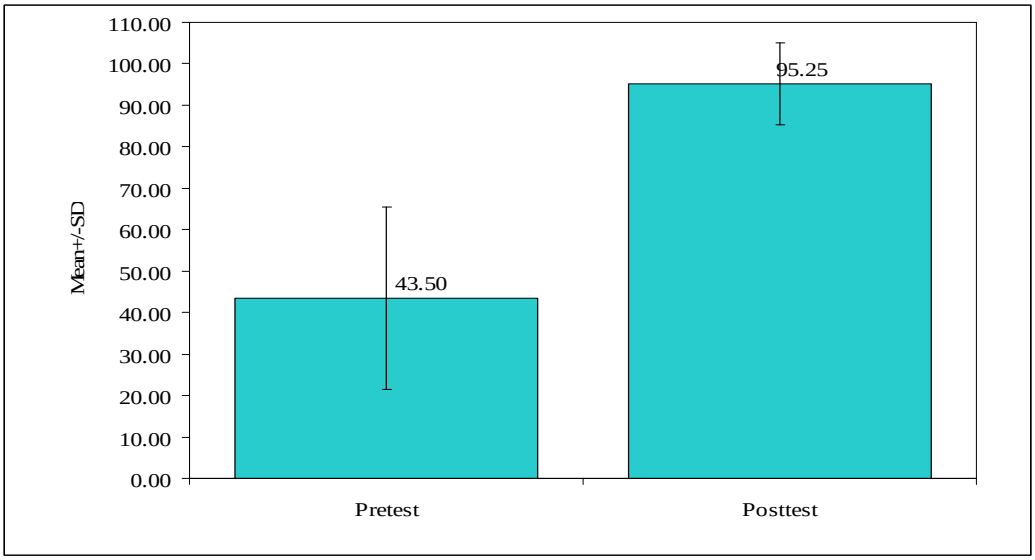


Table No - 33: Levels of Knowledge scores of Baby Care (n=100)

Levels of knowledge of **Baby care after birth**	Pretest		Posttest		Mc Nemar test
	No	%	No	%	
Low level (<=50%)	75	75.00	0	0.00	**P<0.001**
High level (>50%)	25	25.00	100	100.00	
Total	100	100.00	100	100.00	

Table No - 33: Mc Nemar test showed a significant increase in the high level (>50%) knowledge score of post-test from 25 to 100 with a p-value of <0.001 at 95% CI.

Table No - 34: Association between levels of Pre-test knowledge of Baby Care with demographic profile of respondents by Chi-Square (χ^2) Test (n=100)

Demographic profile	Levels of pretest knowledge towards Baby care after birth					χ^2	p-value
	Low level	%	High level	%	Total		
Age groups							
< 30 years	5	6.67	4	16.00	9	3.3460	0.1880
30-39 years	52	69.33	12	48.00	64		
>=40years	18	24.00	9	36.00	27		
Marital status							
Married	65	86.67	21	84.00	86	0.1110	0.7390
Divorced/separated	10	13.33	4	16.00	14		
Religions							
Hindu	74	98.67	24	96.00	98	0.6800	0.4090
Muslims	1	1.33	1	4.00	2		
Levels of education							
Primary	16	21.33	2	8.00	18	14.2820	**0.0010***
Secondary	49	65.33	20	80.00	69		
Undergraduate	10	13.33	3	12.00	13		
Family belongs to							
BPL	55	73.33	21	84.00	76	0.2920	0.5890
APL	20	26.67	4	16.00	24		
Types of family							
Nuclear	38	50.67	15	60.00	53	0.0130	0.9080
Joint	37	49.33	10	40.00	47		

Total No. of Family Members							
<=5	42	56.00	17	68.00	59	3.1000	0.0780
>5	33	44.00	8	32.00	41		
Experience							
6–12 months	9	12.00	0	0.00	9		
13-24months	6	8.00	1	4.00	7	2.3980	0.4940
25–36 months	3	4.00	3	12.00	6		
>=37months	57	76.00	21	84.00	78		
Training received							
<=4times	36	48.00	9	36.00	45	0.6600	0.4170
>4 times	39	52.00	16	64.00	55		
Received any training in last 3 months							
No	43	57.33	18	72.00	61	1.6950	0.1930
Yes	32	42.67	7	28.00	39		
Total	75	100.00	25	100.00	100		

Table No - 34: According to Chi-Square (χ^2) test there was a significant association between levels of pre-test knowledge of baby care with level of education of respondents. Respondents with secondary level of education had high pre-test knowledge scores compared to other level of education with a p-value of 0.0010 at 95% CI.

Table No - 35: Summary of Pre-test and Post-test Knowledge scores of Breastfeeding (n=100)

Knowledge of	Time point	Mean	SD	95% CI for mean	
				Lower	Upper
Breastfeeding	Pretest	64.40	10.72	59.83	68.97
	Posttest	96.40	3.93	94.87	97.93

Table No - 35: The mean pre-test knowledge score of breastfeeding was 64.40±10.72 which increased significantly after intervention to a post-test knowledge score of 96.40±3.93.

Table No - 36: Comparison of Pre-test and Post-test Knowledge scores of Breastfeeding (n=100)

Knowledge towards	Time point	Mean	SD	Mean Diff.	SD Diff.	t-value	p-value
Breastfeeding	Pretest	64.40	23.02				
	Posttest	96.40	7.72	32.00	24.45	13.0860	**<0.001**

Table No - 36: Comparison of pre-test and post-test knowledge scores of breastfeeding by Dependent t-test showed that there was a significant difference between pre-test and post-test knowledge scores of breastfeeding with a p-value of <0.001 at 95% CI.

Figure No - 16: Comparison of Pre-test and Post-test knowledge scores of Breastfeeding

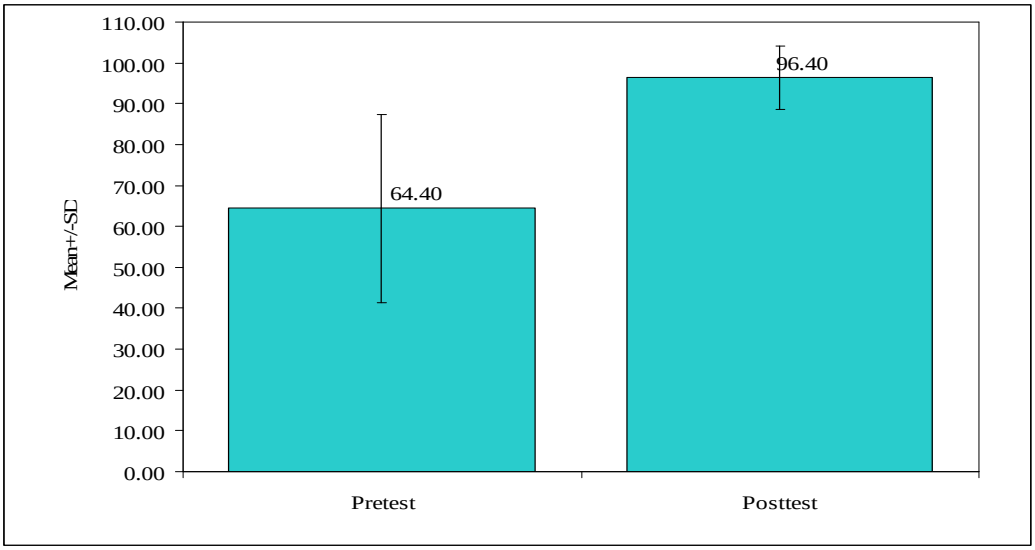


Table No - 37: Levels of Knowledge scores of Breastfeeding (n=100)

Levels of knowledge of **Breastfeeding**	Pretest		Posttest		Mc Nemar test
	No	%	No	%	
Low level (<=50%)	24	24.00	0	0.00	**P<0.001**
High level (>50%)	76	76.00	100	100.00	
Total	100	100.00	100	100.00	

Table No - 37: Mc Nemar test showed a significant increase in the high level (>50%) knowledge score of breastfeeding in post-test (from 76 to 100) with a p-value of <0.001 at 95% CI.

Table No - 38: Association between levels of Pre-test Knowledge of Breastfeeding with demographic profile of respondents by Chi-Square (χ^2) Test (n=100)

Demographic profile	Levels of pretest knowledge towards Breastfeeding					χ^2	p-value
	Low level	%	High level	%	Total		
Age groups							
< 30 years	2	8.33	7	9.21	9	3.3460	0.1880
30-39 years	13	54.17	51	67.11	64		
>=40years	9	37.50	18	23.68	27		
Marital status							
Married	22	91.67	64	84.21	86	0.1110	0.7390
Divorced/separated	2	8.33	12	15.79	14		
Religions							
Hindu	24	100.00	74	97.37	98	0.6800	0.4090
Muslims	0	0.00	2	2.63	2		
Levels of education							
Primary	10	41.67	8	10.53	18	14.2820	**0.0010***
Secondary	12	50.00	57	75.00	69		
Undergraduate	2	8.33	11	14.47	13		
Family belongs to							
BPL	20	83.33	56	73.68	76	0.2920	0.5890
APL	4	16.67	20	26.32	24		
Types of family							
Nuclear	14	58.33	39	51.32	53	0.0130	0.9080
Joint	10	41.67	37	48.68	47		

Total No. of Family Members							
<=5	15	62.50	44	57.89	59	3.1000	0.0780
>5	9	37.50	32	42.11	41		
Experience							
6–12 months	5	20.83	4	5.26	9		
13-24months	1	4.17	6	7.89	7	2.3980	0.4940
25–36 months	1	4.17	5	6.58	6		
>=37months	17	70.83	61	80.26	78		
Training received							
<=4times	10	41.67	35	46.05	45	0.6600	0.4170
>4 times	14	58.33	41	53.95	55		
Received any training in last 3 months							
No	12	50.00	49	64.47	61	1.6950	0.1930
Yes	12	50.00	27	35.53	39		
Total	24	100.00	76	100.00	100		

Table No - 38: Chi-Square (χ^2) test revealed that there was a significant association between levels of pre-test knowledge of breastfeeding and education level of respondents. Respondents with undergraduate education level had high pre-test knowledge scores compared to other level of education with a p-value of 0.0010 at 95% CI.

Table No - 39: Multiple logistic regression analysis of high level of Pre-test knowledge of Breastfeeding with demographic profile (n=100)

Demographic profile	Adjusted OR	95% CI for odds ratio		p-value
		Lower	Upper	
Age groups				
< 30 years	Ref.			
30-39 years	0.21	0.01	3.20	0.2590
>=40years	0.06	0.00	1.59	0.0920
Levels of education				
Primary	Ref.			
Secondary	0.01	0.00	0.11	**0.0020***
Undergraduate	0.11	0.01	1.40	0.0900
Family belongs to				
BPL	Ref.			
APL	6.55	0.45	94.52	0.1670
Types of family				
Nuclear	Ref.			
Joint	0.13	0.01	1.15	0.0670
Total No. of Family Members				
<=5	Ref.			
>5	2.06	0.27	16.00	0.4890
Experience				
6–12 months	Ref.			
13-24months	695.58	6.79	71221.91	**0.0060***

25–36 months	0.96	0.04	23.82	0.9790
>=37months	108.69	4.27	2764.93	**0.0050***
Training received				
<=4times	Ref.			
>4 times	1.19	0.22	6.61	0.8400
Received any training in last 3 months				
No	Ref.			
Yes	0.15	0.02	0.97	**0.0460***

Table No - 39: According to multiple logistic regression analysis there was significant association between high level of Pre-test knowledge of Breastfeeding among the respondents who had secondary level of education, 13-24 months and >=37months of experience and also who had received any training in last 3 months.

Table No - 40: Summary of Pre-test and Post-test Practice scores of ANC Service Provision (n=100)

Practice of	Time point	Mean	SD	95% CI for mean	
				Lower	Upper
ANC Services	Pretest	64.38	10.72	69.82	70.00
	Posttest	88.93	3.93	89.87	90.00

Table No - 40: The mean pre-test score of ANC service provision was 64.38±10.72 with significant increase in post-test knowledge score of 88.93±3.93 after intervention.

Table No - 41: Comparison of Pre-test and Post-test Practice scores of ANC Services (n=100)

Practice of	Time point	Mean	SD	Mean Diff.	SD Diff.	t-value	p-value
ANC Services	Pretest	67.10	13.73				
	Posttest	89.40	2.39	22.30	14.41	15.4702	**<0.001**

Table No - 41: Comparison of pre-test and post-test knowledge scores of ANC Service Provision by Dependent t-test showed that there was a significant difference between pre-test and post-test knowledge scores of ANC Service Provision (from 67.10 to 89.40) with a p-value of <0.001 at 95% CI.

Figure No - 17: Comparison of Pre-test and Post-test Practice scores of ANC Services

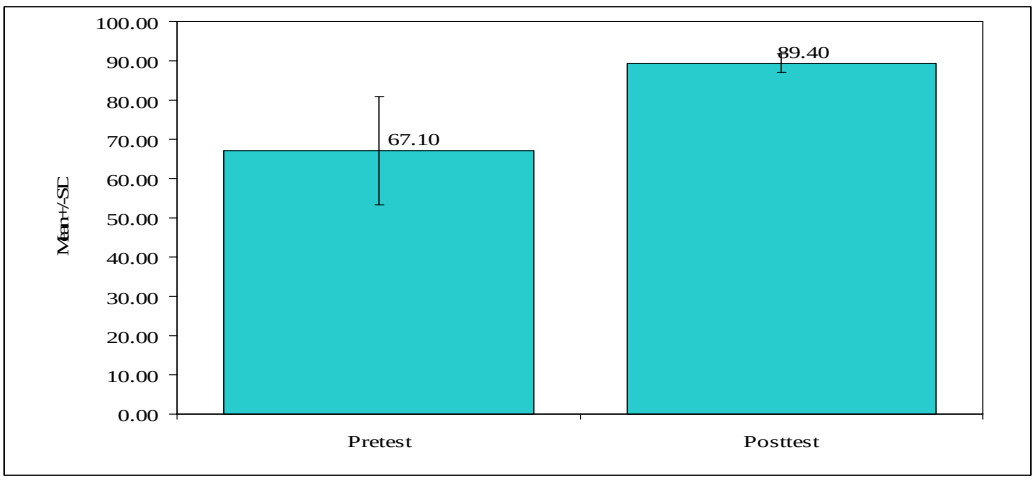


Table No - 42: Levels of Practice scores of ANC Services (n=100)

Levels of Practice of ANC Services	Pretest		Posttest		Mc Nemar test
	No	%	No	%	
Low level (<=50%)	12	12.00	0	0.00	**P<0.001**
High level (>50%)	88	88.00	100	100.00	
Total	100	100.00	100	100.00	

Table No - 42: Mc Nemar test showed a significant increase in the post-test High level (>50%) practice score of ANC services (from 88 to 100) with a p-value of <0.001 at 95% CI.

Table No - 43: Association between levels of Pre-test practice of ANC Services with demographic profile of respondents by Chi-Square (χ^2) Test (n=100)

Demographic profile	Levels of Pre-test Practice of ANC Services					χ^2	p-value
	Low level	%	High level	%	Total		
Age groups							
< 30 years	1	8.33	8	9.09	9	0.2780	0.8700
30-39 years	7	58.33	57	64.77	64		
>=40years	4	33.33	23	26.14	27		
Marital status							
Married	10	83.33	76	86.36	86	0.0810	0.7770
Divorced/separated	2	16.67	12	13.64	14		
Religions							
Hindu	12	100.00	86	97.73	98	0.2780	0.5980
Muslims	0	0.00	2	2.27	2		
Levels of education							
Primary	6	50.00	12	13.64	18	10.2440	**0.0060***
Secondary	6	50.00	63	71.59	69		
Undergraduate	0	0.00	13	14.77	13		
Family belongs to							
BPL	10	83.33	66	75.00	76	0.4020	0.5260
APL	2	16.67	22	25.00	24		
Types of family							
Nuclear	8	66.67	45	51.14	53	1.0220	0.3120
Joint	4	33.33	43	48.86	47		

Total No. of Family Members							
<=5	8	66.67	51	57.95	59	0.3310	0.5650
>5	4	33.33	37	42.05	41		
Experience							
6–12 months	3	25.00	6	6.82	9		
13-24months	2	16.67	5	5.68	7	7.1940	0.0660
25–36 months	1	8.33	5	5.68	6		
>=37months	6	50.00	72	81.82	78		
Training received							
<=4times	7	58.33	38	43.18	45	0.9790	0.3220
>4 times	5	41.67	50	56.82	55		
Received any training in last 3 months							
No	7	58.33	54	61.36	61	0.0410	0.8400
Yes	5	41.67	34	38.64	39		
Total	12	100.00	88	100.00	100		

*p<0.05

Table No - 43: Chi-Square (χ^2) test showed a significant association between levels of pre-test practice of ANC services with level of education of respondents. Respondents with undergraduate education had high pre-test practice scores compared to other levels of education with a p-value of 0.0060 at 95% CI.

Table No - 44: Summary of Pre-test and Post-test Practice scores of Birth Preparedness Services (n=100)

Practice of	Time point	Mean	SD	95% CI for mean	
				Lower	Upper
Birth preparedness services	Pretest	46.12	10.72	52.55	44.44
	Posttest	99.18	3.93	99.18	100.16

Table No - 44: The mean pre-test practice score of birth preparedness services was 46.12±10.72 which increased significantly after intervention to a post-test practice score of 99.18±3.93.

Table No - 45: Comparison of Pre-test and Post-test Practice scores of Birth Preparedness Services (n=100)

Practice of	Time point	Mean	SD	Mean Diff.	SD Diff.	t-value	p-value
Birth preparedness services	Pretest	49.33	16.21				
	Posttest	99.67	2.47	50.33	16.67	30.1892	**<0.001**

Table No - 45: Comparison of pre-test and post-test practice scores of birth preparedness services by Dependent t-test showed that there was a significant difference between pre-test and post-test practice scores of birth preparedness services (from 49.33 to 99.67) with a p-value of <0.001 at 95% CI.

Figure No - 18: Comparison of Pre-test and Post-test Practice scores of Birth Preparedness Services

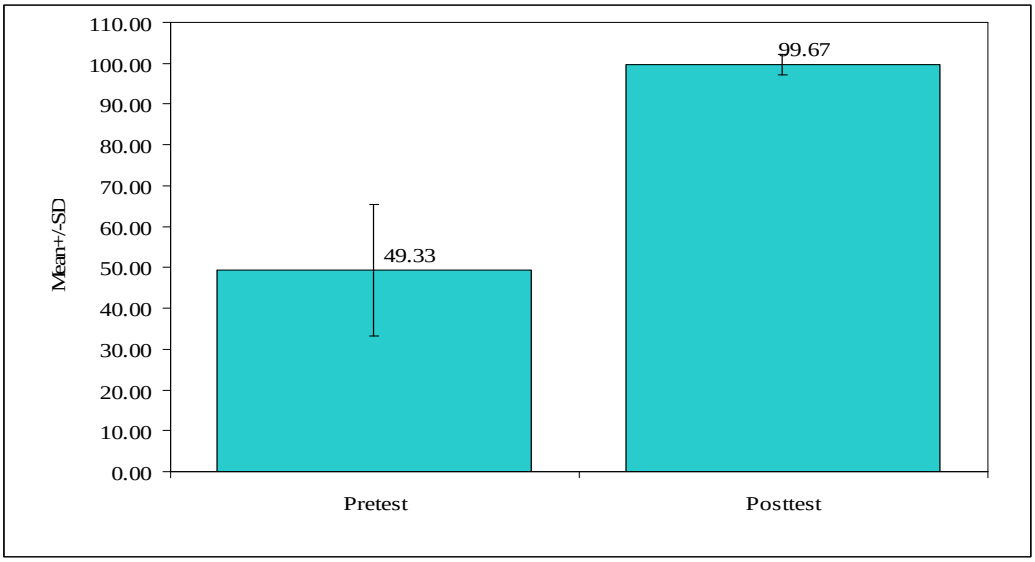


Table No - 46: Levels of Practice scores of Birth Preparedness Services (n=100)

Levels of Practice of birth preparedness services	Pretest		Posttest		Mc Nemar test
	No	%	No	%	
Low level (<=50%)	53	53.00	0	0.00	**P<0.001**
High level (>50%)	47	47.00	100	100.00	
Total	100	100.00	100	100.00	

Table No - 46: Mc Nemar test showed a significant increase in post-test high level (>50%) practice of birth preparedness services score (from 47 to 100%) with a p-value of <0.001 at 95% CI.

(Feasibility & Acceptability Scale was adapted from SUS scale, https://www.usability.gov/how-to-and-tools/methods/system-usability-scale.html)

Table No - 47: Responses of ASHAs towards Feasibility of Birth Planner

ASHAs Feasibility	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
I would use this BPCR Planner frequently.	0	0	0	33	67
I found the BPCR Planner too complex.	56	44	0	0	0
I found the BPCR Planner easy to use.	0	0	0	83	17
I need a skilled person to use this BPCR Planner	4	95	1	0	0
The BPCR Planner features are well integrated.	0	0	3	95	2
There was inconsistency in the BPCR Planner	6	86	8	0	0
Peer counsellors can easily learn to use this BPCR Planner	0	0	0	85	15
I found the BPCR Planner cumbersome to use.	27	73	0	0	0
It was easy to use the BPCR Planner during training	0	0	0	63	37
I needed to learn many things before I could use the BPCR Planner.	0	100	0	0	0

Table No - 47: All the participants agreed to use the planner but 67% strongly agreed that they would use the planner frequently. Almost all (95%) agreed that features of the planner were well integrated. Around half of them i.e., 56% strongly disagreed that the planner was too complex. All the ASHAs agreed that planner was easy to use. Overall response of ASHAs towards Feasibility of using Birth Planner was favorable.

Table No - 48: Responses of ASHAs towards Acceptability of Birth Planner

ASHAs Acceptability	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
I liked to use the BPCR Planner	0	0	0	28	72
The BPCR Planner was complex.	57	43	0	0	0
The BPCR Planner was easy to use	0	0	0	83	17
I needed a skilled person to use the BPCR Planner	3	95	2	0	0
The parts of the BPCR Planner fit together well	0	0	3	96	1
There was inconsistency in the BPCR Planner	7	85	8	0	0
I learned to use the BPCR Planner quickly	0	0	0	75	25
I found the BPCR Planner cumbersome to use	23	77	0	0	0
I felt confident using the BPCR Planner	0	0	0	84	16
I needed to learn many things before I could use the BPCR Planner	1	99	0	0	0

Table No - 48: Majority of the respondents (72%) strongly agreed that they liked to use the planner. Most of them (83%) agreed that planner was easy to use and 96% agreed that the parts of planner fit together well. Around 84% agreed that they felt confident in using the planner. Responses of ASHAs towards Acceptability of using Birth Planner were favorable

ASHA: Support Mechanisms and Barriers

Table No - 49: Distribution of ASHAs according to Support Mechanisms and Barriers (n=100)

Variables		Yes	No
Do you feel awarded in your role as ASHA?		99	1
What makes you feel rewarded about being ASHA?	Recognition in community	66	44
	To make difference in women's lives	91	9
	Being able to help others	89	11
	Opportunity to learn new things	28	72
	Appreciation from superiors	5	95
What can be done to make you communicate more effectively with pregnant woman and her family?	Provision of flip book/chart/posters	19	81
	Support from ANM/AWW during home visit	91	9
	Conducting counselling sessions at AWC/VHND	13	87
	Support for conducting group meetings / counselling sessions	17	83
	Provision of flip book/chart/posters	19	81
Whom do you first contact when you have difficulty in interacting with pregnant woman?	Anganwadi worker	1	99
	ANM	99	1
	Medical officer	0	100
Who is more accessible to you?	Anganwadi worker	1	99
	ANM	99	1
	Medical officer	2	98
Where you feel you need more support in helping pregnant woman of your community?	Subcentre	1	99
	ANM	29	71
	PHC	100	0
	Medical officer	93	7
What are the challenges you face during planning for birth for a woman?	Less salary	80	20
	Delayed salary	22	78
	More workload	90	10
	Non-cooperation from community people	59	41

Table No - 49: It has been observed that almost all (99) of them felt awarded in their role as ASHA. Majority of the ASHAs felt rewarded because of recognition in community (66), making difference in women's lives (91), and being able to help others (89). Majority (91) of them agreed that support from ANM/AWW during home visit makes it easy to communicate more effectively with pregnant woman and her family members. Almost all (99) of them first contact ANM when they have difficulty in interacting with pregnant woman. They revealed that ANM's are more accessible for them. Majority of them revealed that they need more support from PHC (100) and Medical Officer (93) in helping pregnant woman of their community. More workload (90), less salary (80), non-cooperation from community people (59) and delayed salary (22) were the common barriers or challenges faced by ASHAs.

All ASHAs felt honoured being ASHA workers. Job satisfaction was due to the respect and dignity they receive from the community. They felt satisfied because they were able to bring changes in women's life and saved the precious lives of mother and baby in critical conditions.

Birth Preparedness Service Provision by ASHAs

Identification of health care facility for delivery and referral: ASHAs identified nearby PHCs and CHCs for delivery and emergency services. They identified and registered all pregnant women to Government District Hospital, Belagavi which is in the radius of approximately 30 km from all study clusters. Quick and appropriate services are provided in this tertiary care hospital and out of pocket expenditure is also negligible amount compared other private hospitals. They also explained about cash (JSY – Janani Suraksha Yojana) and transport assistance benefits for institutional delivery to the pregnant women.

Emergency Transport Arrangement: "108 Emergency Service" is a free transport service provided by the government. Majority of the ASHAs called 108 Ambulance for emergencies as well as for deliveries. As an alternative measure, ASHAs identified local cars and taxis for emergency. Bus facilities were also available in most of the areas.

Emergency Funds Arrangement: ASHAs kept on counseling pregnant women and families to save money for emergency, transportation and delivery services. They sought help from Self Help Groups – SHG, micro financing agencies, local societies in the form of loans. They raised transport assistance funds from VHSC - Village Health and Sanitation Committee of Gram Panchayat. Sometimes during emergencies, they paid funds from their pocket.

Arrangement of Birth Companion: Most of the times ASHAs accompanied pregnant women for delivery and in emergency situations. They identified pregnant woman's relatives, friends and neighbours as birth companions.

Arrangement of Blood Donors: ASHAs identified pregnant woman's relatives as blood donors by getting them checked for blood groups and Rh compatibility. In many instances, they collected blood donation cards from blood donation camps arranged in their area by making the relatives to donate the blood. They used these cards for arrangement of blood in emergencies. Majority of the ASHAs agreed that they identify blood donors only in high-risk pregnancies, but after the educational intervention they identified for all pregnant women.

Importance of Continuous Refresher Training: Regardless of the region, ongoing training and capacity-building initiatives are crucial to empower ASHAs and enhance their effectiveness in healthcare delivery. Providing regular training sessions can update their knowledge, keep them motivated, and improve their ability to tackle new health challenges.

RESULTS OF MOTHERS' DATA ANALYSIS

Table No - 50: Comparison of two groups of mothers (without and with training) according to demographic profile (n=400 in each group)

Profile	Without training	%	With training	%	Total	%	Chi-square test	p-value
Age groups								
18-20 years	27	6.75	23	5.75	50	6.25		
20-29 years	344	86.00	346	86.50	690	86.25	0.3920	0.8220
30-39 years	29	7.25	31	7.75	60	7.50		
Religion								
Hindu	355	88.75	344	86.00	699	87.38	1.3710	0.2420
Muslim	45	11.25	56	14.00	101	12.63		
Highest Level of Education of Participant								
Illiterate	9	2.25	8	2.00	17	2.13		
Primary	36	9.00	32	8.00	68	8.50		
Secondary	205	51.25	173	43.25	378	47.25	7.6970	0.1740
Undergraduate	107	26.75	131	32.75	238	29.75		
Graduate	39	9.75	53	13.25	92	11.50		
Post-graduate	4	1.00	3	0.75	7	0.88		
Occupation of the participant (National Classification of Occupations)								
Home Maker	390	97.50	381	95.25	771	96.38		
Elementary Unskilled labourer	0	0.00	1	0.25	1	0.13	4.7240	0.3170
Agricultural Worker	2	0.50	1	0.25	3	0.38		
Service Worker	2	0.50	5	1.25	7	0.88		
Skilled Worker	6	1.50	12	3.00	18	2.25		

Highest level of Education of Husband								
Illiterate	17	4.25	8	2.00	25	3.13		
Primary	75	18.75	54	13.50	129	16.13		
Secondary	133	33.25	162	40.50	295	36.88	13.4450	**0.0200***
Undergraduate	126	31.50	111	27.75	237	29.63		
Graduate	41	10.25	58	14.50	99	12.38		
Post-graduate	8	2.00	7	1.75	15	1.88		
Occupation of the Husband (NFHS – National Classification of Occupation)								
Agricultural Worker	71	17.75	80	20.00	151	18.88		
Service Worker	23	5.75	37	9.25	60	7.50	7.7630	0.1700
Skilled Worker	115	28.75	117	29.25	232	29.00		
Elementary Unskilled labourer	127	31.75	119	29.75	246	30.76		
Self-Employed	64	16.00	47	11.75	111	13.88		
Family belongs to								
BPL	372	93.00	330	82.50	702	87.75	20.5130	**0.0001***
APL	28	7.00	70	17.50	98	12.25		
House hold Structure								
Nuclear	47	11.75	49	12.25	96	12.00		
Joint	331	82.75	349	87.25	680	85.00	17.1850	**0.0001***
Extended	22	5.50	2	0.50	24	3.00		
Total number of Family Members								
<=5	120	30.00	125	31.25	245	30.63	0.1470	0.7010
>5	280	70.00	275	68.75	555	69.38		

Order of Pregnancy								
First	166	41.50	154	38.50	320	40.00		
Second	148	37.00	162	40.50	310	38.75		
Third	68	17.00	61	15.25	129	16.13	4.2400	0.3750
Fourth	16	4.00	16	4.00	32	4.00		
More than four	2	0.50	7	1.75	9	1.13		
Total	**400**	**100.00**	**400**	**100.0**	**800**	**100.0**		

*p<0.05

Socioeconomic Status: B.G.Prasad Classification (2019) (n=400 in each group)

Socioeconomic Status (B. G. Prasad – 2019)	**'Without training' group of Mothers**		**'With training' group of Mothers**	
	Number (N)	**Percentage (%)**	**Number (N)**	**Percentage (%)**
Upper Class	7	1.75	7	1.75
Upper middle class	28	7.00	22	5.50
Middle class	24	6.00	44	10.75
Lower middle class	146	36.50	178	44.50
Lowe class	195	48.75	149	37.50
Grand Total	**400**	**100.00**	**400**	**100.00**

Table No - 48: Majority (86.25%) of the mothers were in the age group of 20-29 years. Around 7.5% were in the age group of >=30 years and only 6.25% were in the age group of <20 years. Majority (87.38%) of them were Hindus and only 12.63% were Muslims. Around half of them (47.25%) had secondary level of education whereas only 8.5 % of them had primary level of education, 29.75% of them were undergraduates, 11.5% of them were graduates and 0.88% had postgraduate education. Majority (96.38%) were home makers and only 2.25% were skilled

workers. Around 30.75% of the mothers' husbands were elementary-unskilled workers, 29% of them were skilled workers, 13.88% were self-employed, 18.88 % were agricultural workers, and 7.5% were service workers. Majority (87.75%) of the families had BPL ration card and rest (12.25%) had APL ration card. Most (85%) of the mothers belonged to joint family, 12% belonged to nuclear families and 3% belonged to extended families. Around two thirds (69.38%) of families had >5 members at home and 30.63% had <=5 members at home. Around 40% of mothers had first pregnancy, 38.75% second, 16.13% third, 4% forth and 1.13% more than four. Out of total 800 mothers, 50% received BPCR training by ASHAs and remaining 50% of mothers did not receive any training. Majority of the mothers (48.75% and 37.50%) belonged to lower class and lower middle class (36.50% and 44.50%) in without-training and with-training group respectively. Both groups of mothers had similar demographic profile.

Figure No - 19: Comparison of two groups of mothers (without and with training) by Age groups

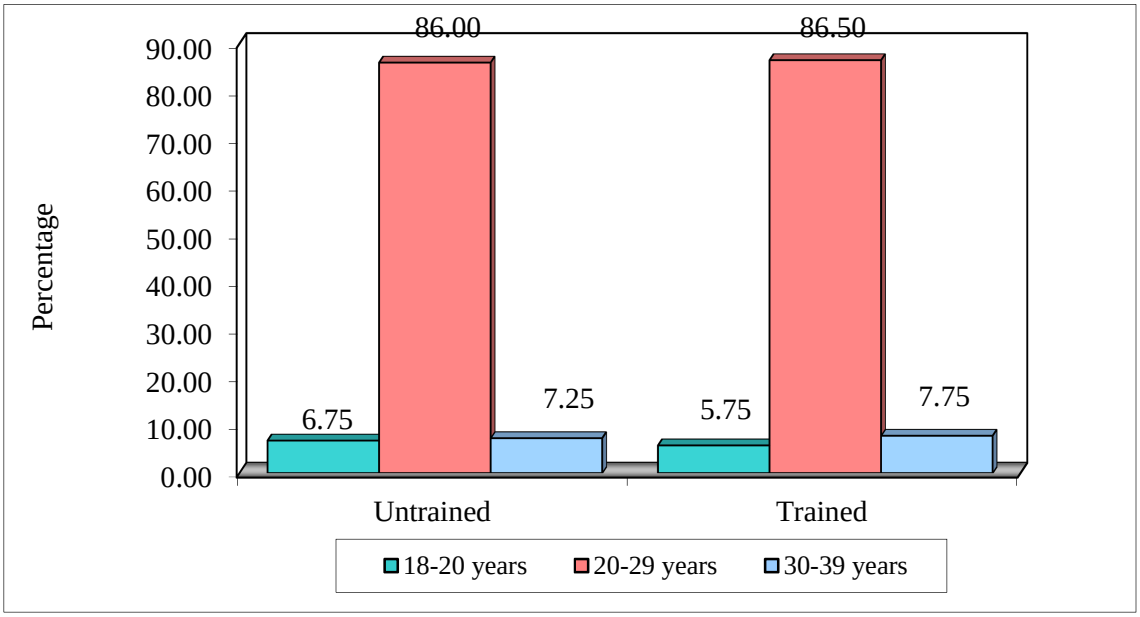


Figure No - 20: Comparison of two groups of mothers (without and with training) by Religion

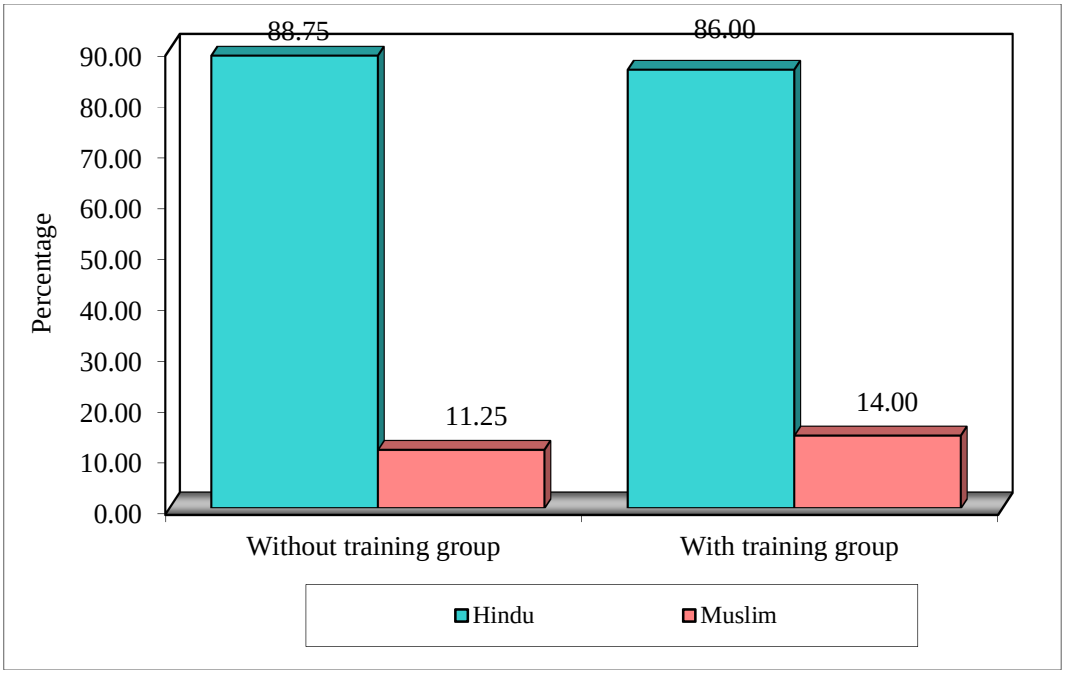


Figure No - 21: Comparison of two groups of mothers (without and with training) by Level of Education

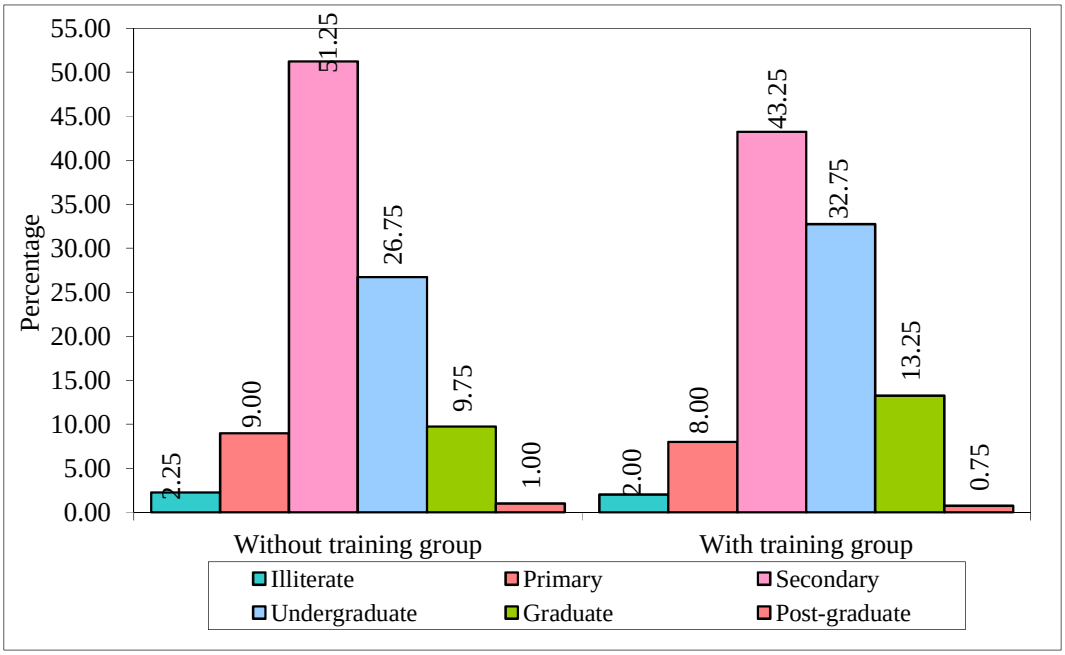


Figure No - 22: Comparison of two groups of mothers (without and with training) by Occupation

Figure No - 23: Comparison of two groups of mothers (without and with training) by Level of Education of Husband

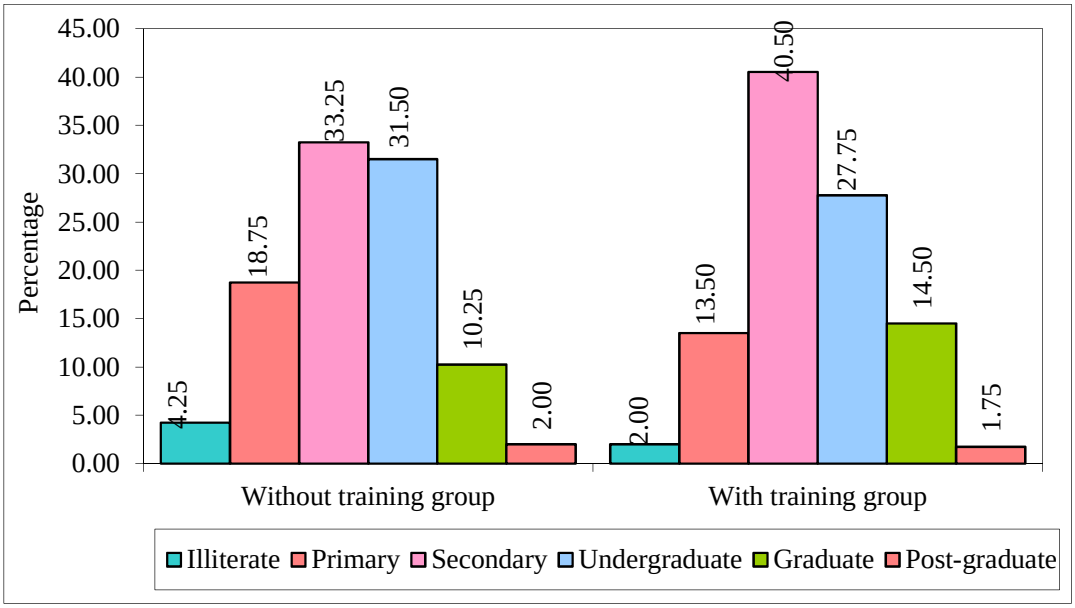


Figure No - 24: Comparison of two groups of mothers (without and with training) by Socioeconomic Status

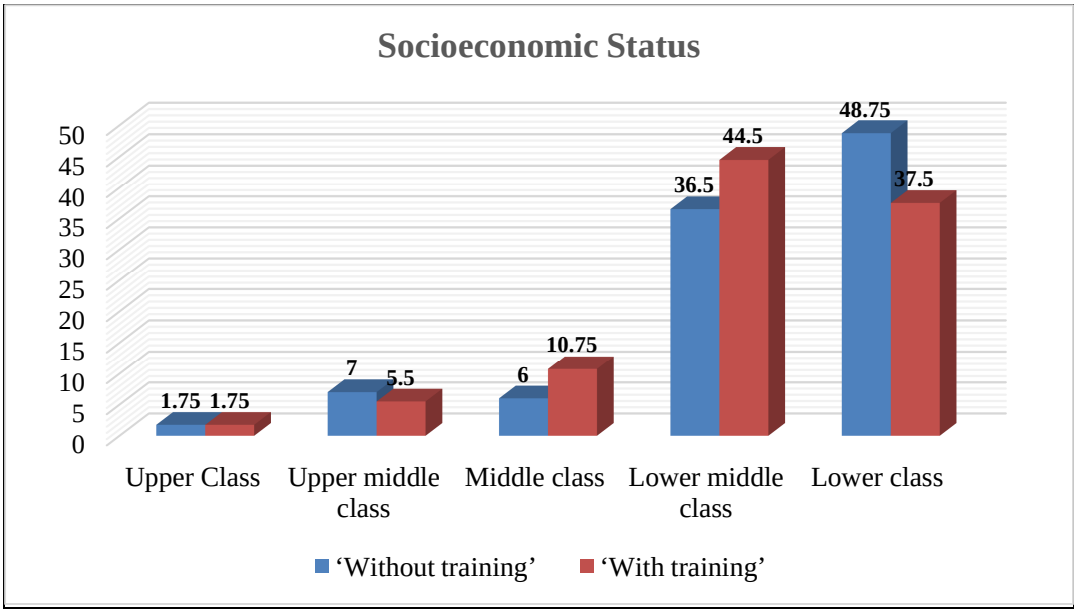


Figure No - 25: Comparison of two groups of mothers (without and with training) by Families having BPL or APL card

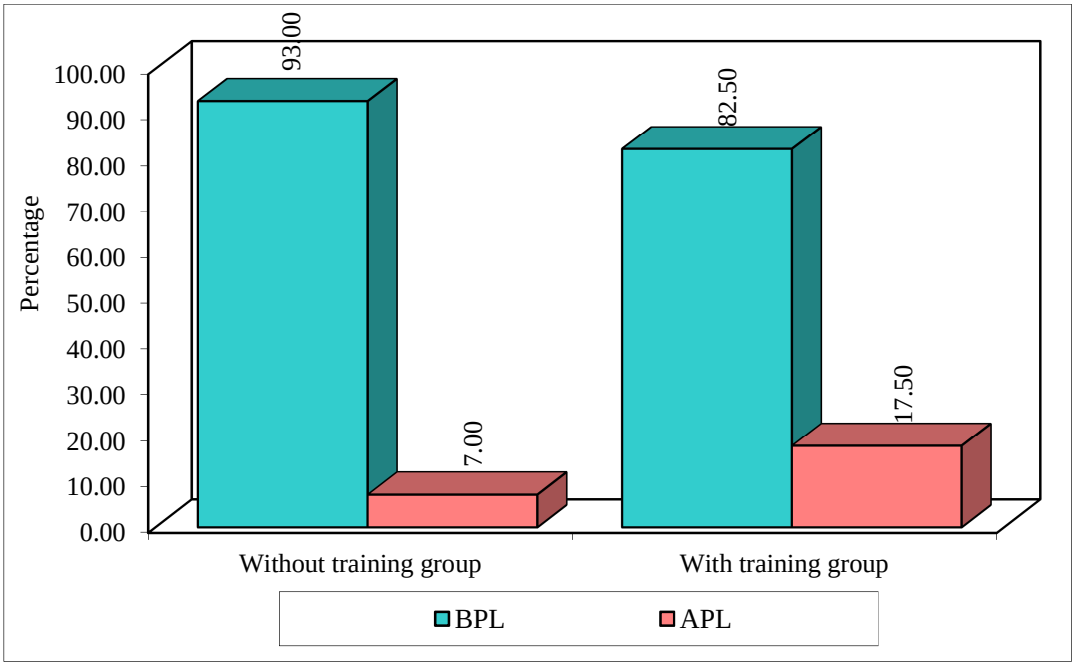


Figure No - 26: Comparison of two groups of mothers (without and with training) by Household Structure

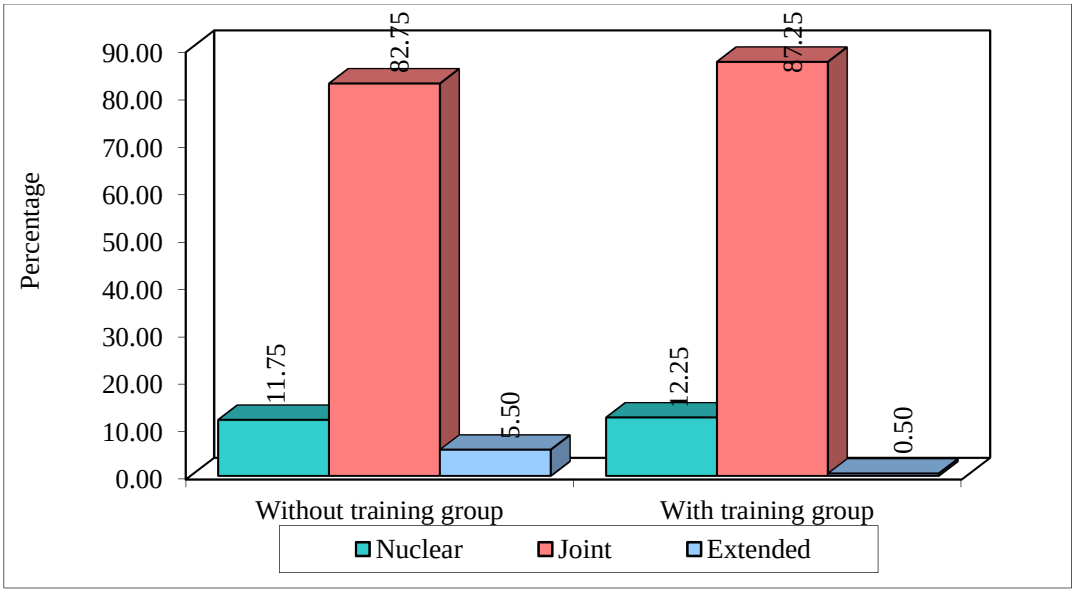


Figure No - 27: Comparison of two groups of mothers (without and with training) by Number of Family Members

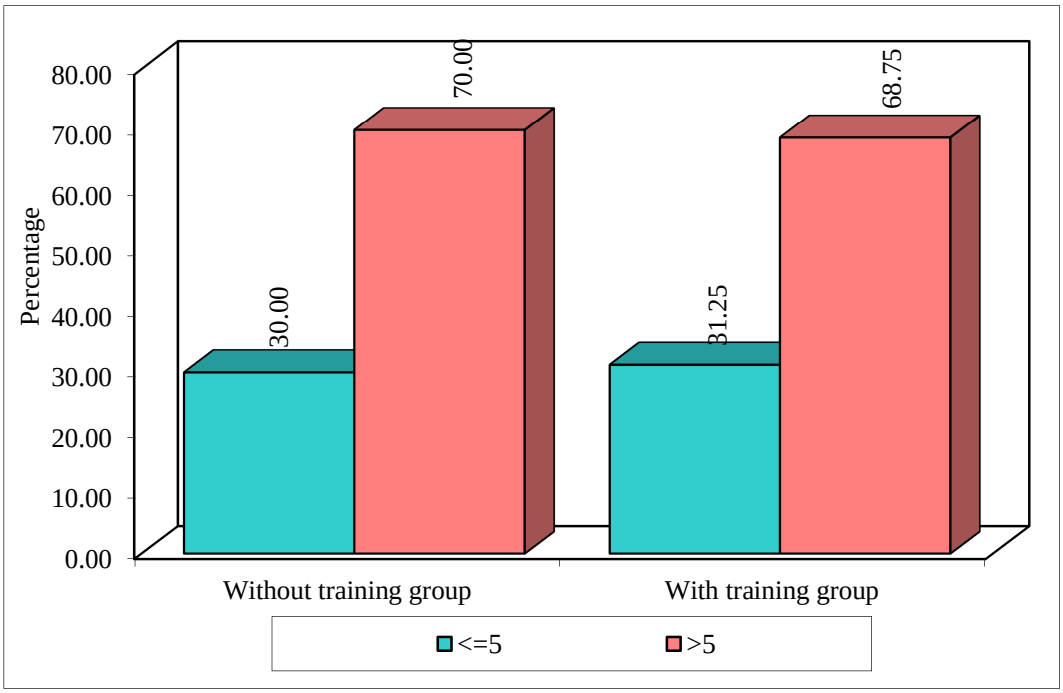


Figure No - 28: Comparison of two groups of mothers (without and with training) by Order of Pregnancy

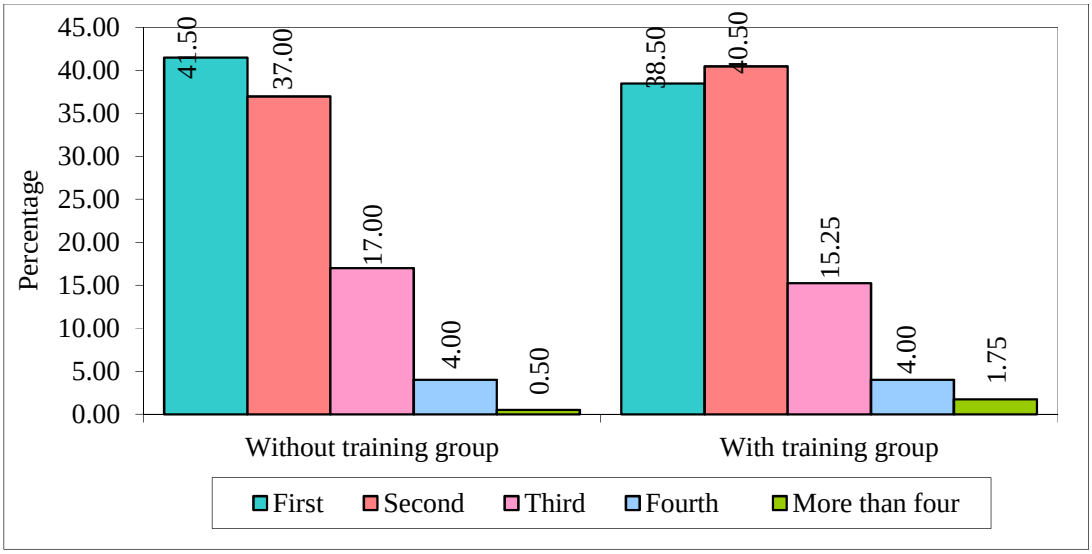


Table No - 51: Comparison of knowledge scores of Pregnancy Danger Signs between two groups of mothers (without and with training) (n=400 in each group)

Knowledge of	Groups	Mean	SD	SE	t-value	P-value
Pregnancy Key Danger Signs	Without training	4.50	11.41	0.57	24.7466	**<0.001**
	With training	38.75	25.22	1.26		
Pregnancy Other Danger Signs	Without training	6.34	8.40	0.42	28.7620	**<0.001**
	With training	22.98	7.96	0.40		
Pregnancy Total Danger Signs	Without training	5.95	7.50	0.37	35.6161	**<0.001**
	With training	26.36	8.67	0.43		

Table No - 51: Comparison of mothers' knowledge scores of pregnancy key danger signs by Independent t-test showed that the mean score of mothers without training was 4.50±11.41 and mothers with training was 38.75±25.22. Mothers' knowledge of other danger signs without training was 6.34±8.40 and with training it increased to 22.98±7.96. Mothers' knowledge of total danger signs without training was 5.95±7.50 and with training it increased to 26.36±8.67 ($p<0.001$ at 95% CI).

Figure No - 29: Comparison of knowledge scores of Pregnancy Danger Signs between two groups of mothers (without and with training)

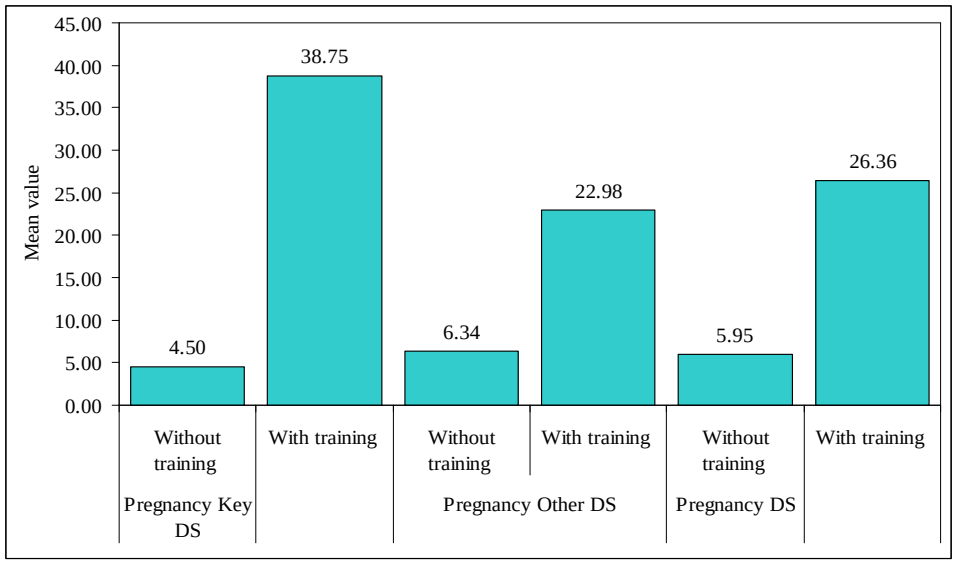


Table No - 52: Comparison of knowledge scores of ANC between two groups of mothers (without and with training) (n=400 in each group)

Variable	Groups	Mean	SD	SE	t-value	P-value
ANC Knowledge	Without training	47.39	12.50	0.63	12.3115	**<0.001**
	With training	57.98	11.81	0.59		

Table No - 52: Comparison of mothers' knowledge scores of ANC by Independent t-test showed that the mean score of mothers without training was 47.39±12.50 and mothers with training was 57.98±11.81. Mothers with training had significantly high knowledge towards ANC compared to mothers without training with p-value of <0.001 at 95% CI.

Figure No - 30: Comparison of knowledge scores of ANC between two groups of mothers (without and with training)

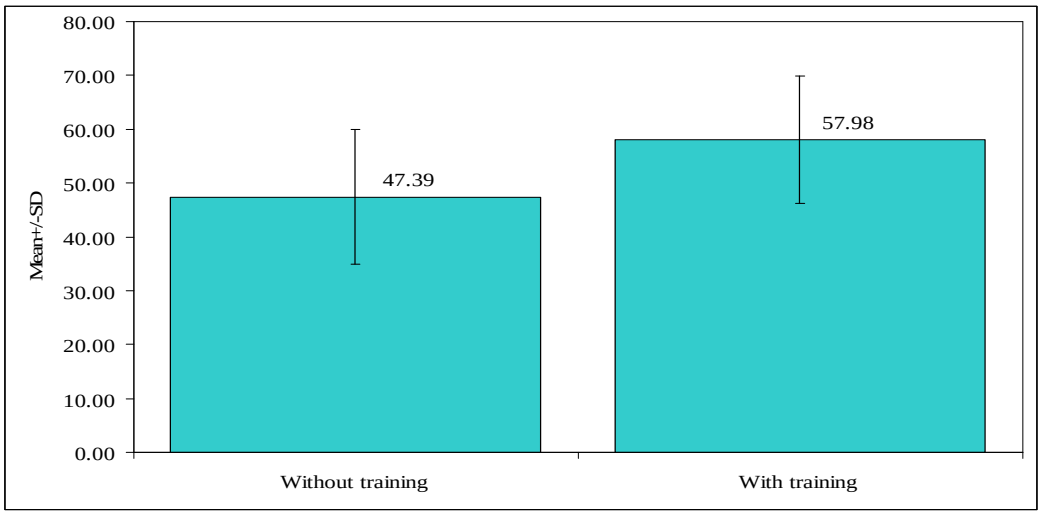


Table No - 53: Knowledge of Information given by ASHAs to Without-Training & With-Training group of Mothers

Information given by ASHAs	Without Training Group (n=400)		With Training Group (n=400)	
	Yes	No	Yes	No
	n (%)	n (%)	n (%)	n (%)
All the pregnant women are at risk of developing pregnancy related complications	4 (1)	396 (99)	86 (21.5)	314 (78.5)
Maternal complications are unpredictable but are treatable	1 (0.25)	399 (99.75)	225 (56.25)	175 (43.75)
Importance and components of ANC visits	385 (96.25)	15 (3.75)	397 (99.25)	3 (0.75)
Signs and symptoms of complications during pregnancy, childbirth and postpartum period	0 (0)	400 (100)	344 (86)	56 (14)
Birth preparedness plan	80 (20)	320 (80)	395 (98.75)	5 (1.25)
Family planning (contraceptive) methods	8 (2)	392 (98)	203 (50.75)	197 (49.25)
Nutrition & hygiene education	254 (63.5)	146 (36.5)	260 (65)	140 (35)

Table No – 53: In **Without Training group** around 99% of the mothers did not receive any information from ASHAs regarding risk of developing pregnancy related complications, maternal complications are unpredictable but are treatable, signs and symptoms of complications during pregnancy, childbirth and postpartum period and family planning methods. Majority (96.25%) of them received information regarding ANC but only 20% of them received information regarding birth plan. After training of ASHAs on BPCR, **With Training group** of mothers received information regarding above factors. Majority (98.75%) of them received birth plan information.

Table No - 54: Comparison of knowledge scores of Information given by ASHA during Pregnancy between two groups of mothers (without and with training) (n=400 in each group)

Knowledge of	Groups	Mean	SD	SE	t-value	P-value
Information given by ASHA during Pregnancy	Without training	23.36	7.53	0.38	47.5025	**<0.001**
	With training	60.36	13.64	0.68		

Table No - 54: Comparison between mothers' knowledge scores of information given by ASHA during pregnancy by Independent t-test showed that mean score of mothers without training was 23.36±7.53 and mothers with training was 60.36±13.64. Mothers with training had significantly high knowledge towards information given by ASHA during pregnancy compared to mothers without training with p-value of <0.001 at 95% CI.

Figure No - 31: Comparison of knowledge scores of Information given by ASHA during Pregnancy between two groups of mothers (without and with training)

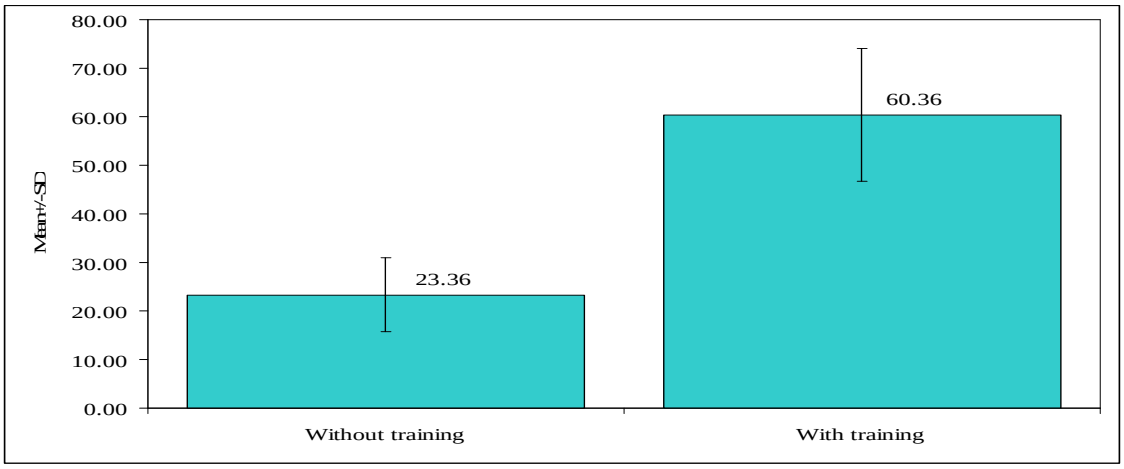


Table No - 55: Comparison of knowledge scores of Labor & Childbirth Danger Signs between two groups of mothers (without and with training) (n=400 in each group)

Knowledge of	Groups	Mean	SD	SE	t-value	P-value
Labor & Childbirth Key Danger Signs	Without training	6.06	11.44	0.57	26.2423	**<0.001**
	With training	27.81	12.00	0.60		
Labor & Childbirth Other Danger Signs	Without training	3.75	8.78	0.44	8.6564	**<0.001**
	With training	9.80	10.87	0.54		
Labor & Childbirth Total Danger Signs	Without training	4.78	7.75	0.39	24.5570	**<0.001**
	With training	17.81	7.25	0.36		

Table No - 55: Comparison between mothers' knowledge scores of labor & childbirth danger signs by Independent t-test showed that mean score of knowledge of key danger signs of mothers without training was 6.06±11.44 and mothers with training was 27.81±12.00. Mean score of knowledge of other danger signs of mothers without training was 3.75±8.78 and mothers with training was 9.80±10.87. Mean score of knowledge of total danger signs of mothers without training was 4.78±7.75 and mothers with training was 17.81±7.25. Mothers with training had significantly high knowledge of labor & childbirth danger signs compared to mothers without training with p-value of <0.001 at 95% CI.

Figure No - 32: Comparison of knowledge scores of Labor & Childbirth Danger Signs between two groups of mothers (without and with training)

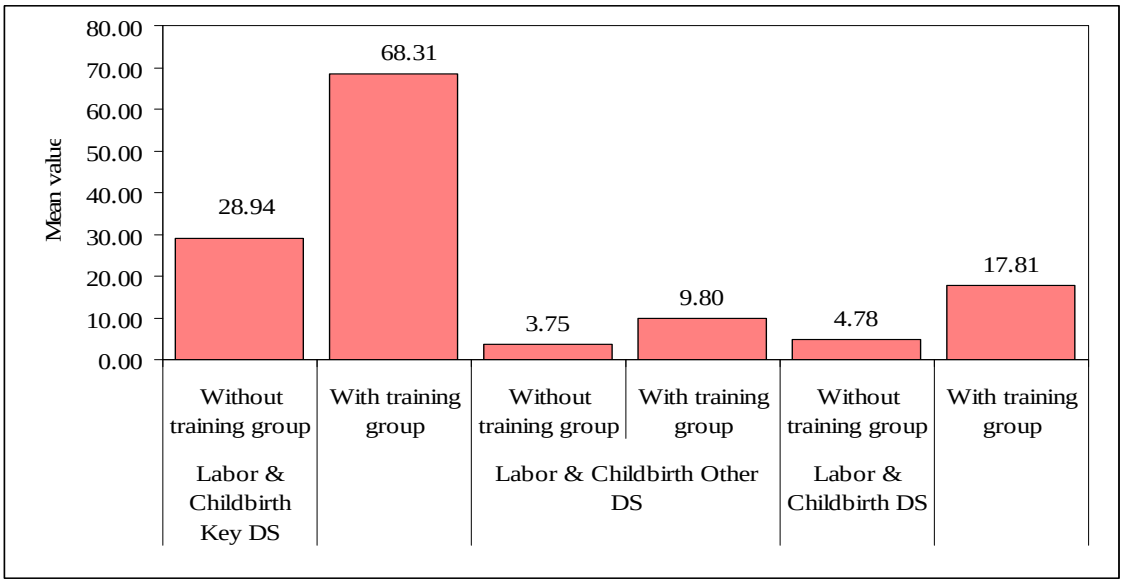


Table No - 56: Comparison of knowledge scores of Birth Preparedness between two groups of mothers (without and with training) (n=400 in each group)

Knowledge of	Groups	Mean	SD	SE	t-value	P-value
Birth Preparedness	Without training	28.94	10.92	0.55	49.5958	**<0.001**
	With training	68.31	11.53	0.58		

Table No - 56: Comparison between mothers' knowledge scores of birth preparedness by Independent t-test showed that mean score of knowledge of mothers without training was 28.94±10.92 and mothers with training was 68.31±11.53. Mothers with training had significantly high knowledge towards birth preparedness compared to mothers without training with p-value of <0.001 at 95% CI.

Figure No - 33: Comparison of knowledge scores of Birth Preparedness between two groups of mothers (without and with training)

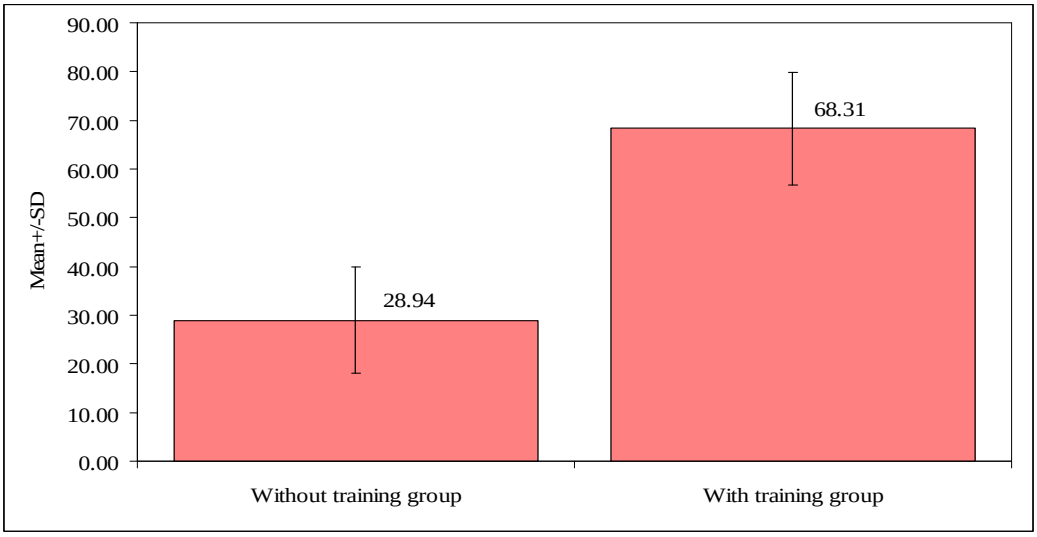


Table No - 57: Comparison of knowledge scores of Postpartum Danger Signs between two groups of mothers (without and with training) (n=400 in each group)

Knowledge of	Groups	Mean	SD	SE	t-value	P-value
Postpartum Key Danger Signs	Without training	6.00	13.66	0.68	12.2183	**<0.001**
	With training	20.42	19.24	0.96		
Postpartum Other Danger Signs	Without training	3.70	6.07	0.30	26.7449	**<0.001**
	With training	15.80	6.71	0.34		
Postpartum Total Danger Signs	Without training	4.23	6.36	0.32	30.5554	**<0.001**
	With training	16.87	5.28	0.26		

Table No - 57: Comparison between mothers' knowledge scores of postpartum danger signs by Independent t-test showed that mean score of knowledge of key danger signs of mothers without training was 6.00±13.66 and mothers with training was 20.42±19.24. Mean score of knowledge of other danger signs of mothers without training was 3.70±6.07 and mothers with training was 15.80±6.71. Mean score of knowledge of total danger signs of mothers without training was 4.23±6.36 and mothers with training was 16.87±5.28. (p=0.0001 at 95% CI).

Figure No - 34: Comparison of knowledge scores of Postpartum Danger Signs between two groups of mothers (without and with training)

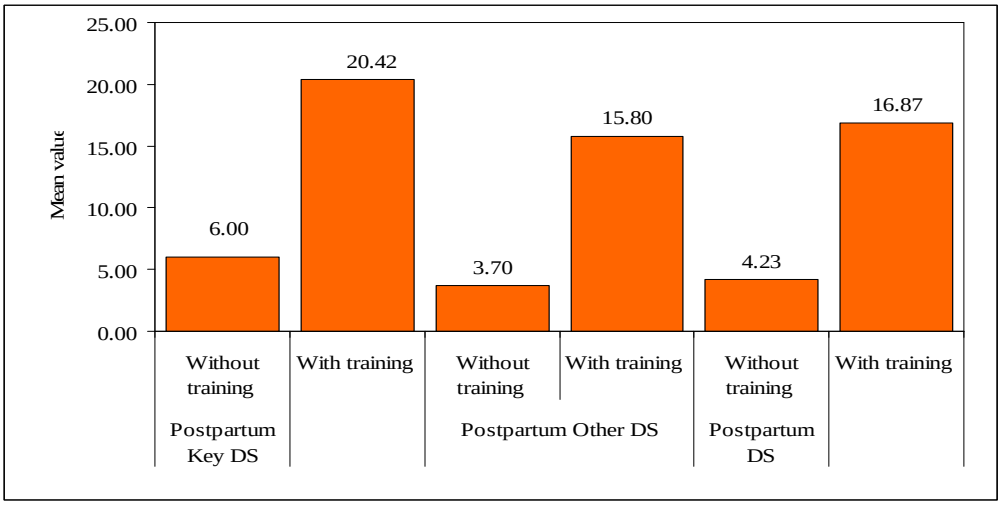


Table No - 58: Comparison of knowledge scores of Baby Care between two groups of mothers (without and with training) (n=400 in each group)

Knowledge of	Groups	Mean	SD	SE	t-value	P-value
Baby care	Without training	45.25	13.28	0.66	19.0744	**<0.001**
	With training	65.33	16.34	0.82		

Table No - 58: Comparison between mothers' knowledge scores of baby care by Independent t-test showed that mean score of knowledge of mothers without training was 45.25±13.28 and mothers with training is 65.33±16.34. Mothers with training had significantly high knowledge of baby care compared to mothers without training with p-value of <0.001 at 95% CI.

Figure No - 35: Comparison of knowledge scores of Baby Care between two groups of mothers (without and with training)

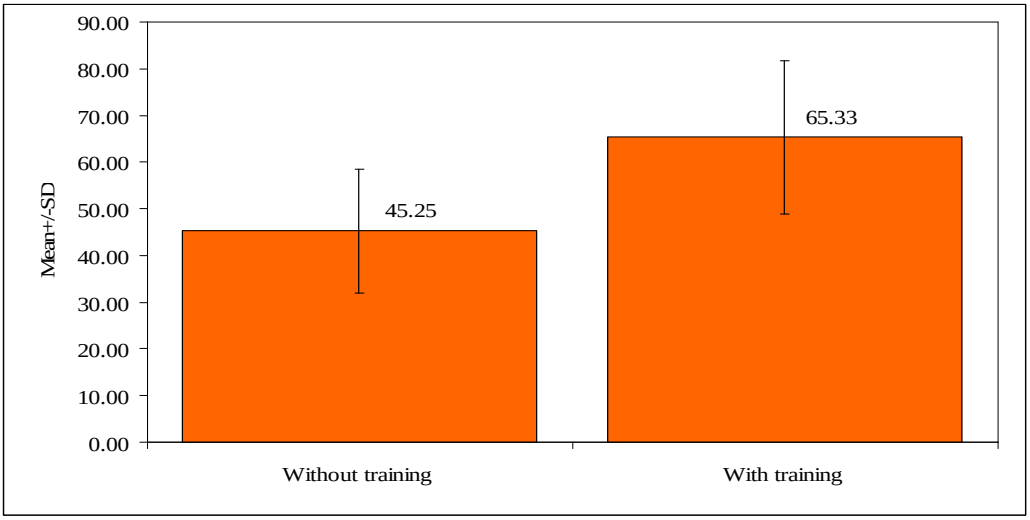


Table No - 59: Postpartum advice given by ASHAs to Without-Training & With-Training group of Mothers

Postpartum advice given by ASHA's	Without Training Group (n=400)		With Training Group (n=400)	
	Yes	No	Yes	No
	n (%)	n (%)	n (%)	n (%)
Rest for at least 6 weeks	86 (21.5)	314 (78.5)	396 (99)	4 (1)
Eat more Nutritious Food	296 (74)	104 (26)	399 (99.75)	1 (0.25)
Exclusive Breastfeeding for 6 months	329 (82.25)	71 (17.75)	378 (94.5)	22 (5.5)
Need for Contraception Methods	135 (33.75)	265 (66.25)	233 (58.25)	167 (41.75)
Hygiene	71 (17.75)	329 (82.25)	279 (69.75)	121 (30.25)

Table No - 62: Before BPCR training of ASHAs, most of the without training group of mothers received advice only regarding eating nutritious food (74%) and exclusive breastfeeding (82.25%) from ASHAs, but most of them did not receive advice regarding rest, need for contraception and hygiene from ASHAs. After BPCR training of ASHAs, majority of with training group of mothers received advice regarding the above factors from ASHAs.

Table No - 60: Comparison of Practice scores of Postpartum advice given by ASHAs between two groups of mothers (without and with training) (n=400 in each group)

Practice of	Groups	Mean	SD	SE	t-value	P-value
Postpartum advice given by ASHAs	Without training	45.85	16.17	0.81	35.7435	**<0.001**
	With training	84.50	14.36	3.21		

Table No - 60: Mean score of postpartum practice of without training mothers was 45.85±16.17 and with training mothers was 84.50±14.36. Mothers with training had significantly high level of practice score of postpartum advice given by ASHAs compared to mothers without training with p-value of <0.001 at 95% CI.

Figure No - 36: Comparison of Practice scores of Postpartum advice given by ASHAs between two groups of mothers (without and with training)

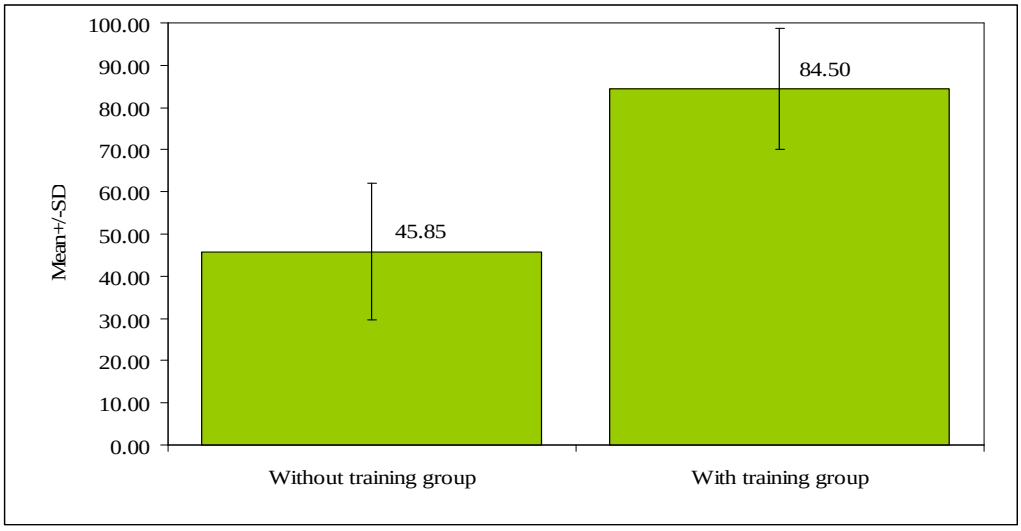


Table No - 61: Comparison of Practice scores of ANC between two groups of mothers (without and with training) (n=400 in each group)

Practice	Groups	Mean	SD	SE	t-value	P-value
Practice of ANC	Without training	61.30	12.50	0.62	11.9870	**<0.001**
	With training	72.43	13.72	0.69		

Table No - 61: Comparison between mothers' practice scores of ANC by Independent t-test showed that mean score of practice of mothers without training was 61.30±12.50 and mothers with training was 72.43±13.72. Mothers with training had significantly high practice scores of ANC compared to mothers without training with p-value of <0.001 at 95% CI.

Figure No - 37: Comparison of Practice scores of ANC between two groups of mothers (without and with training)

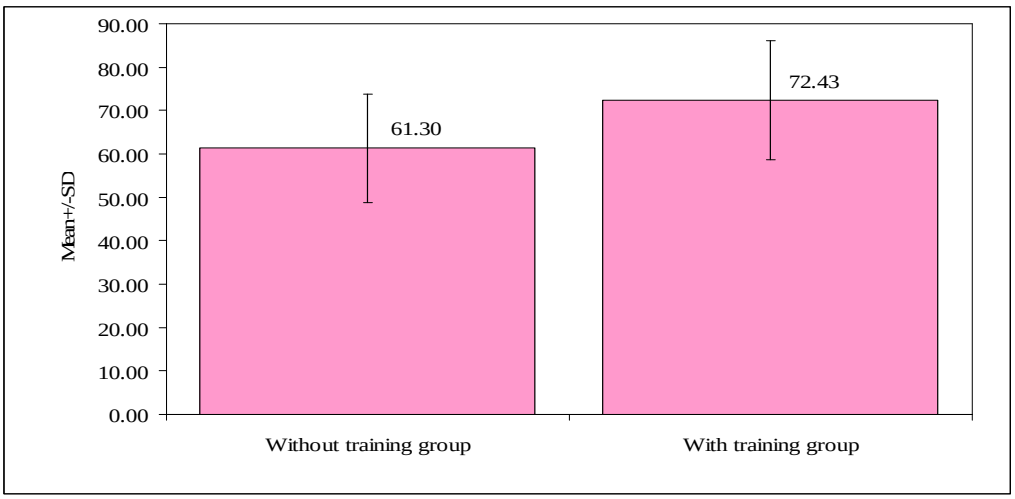


Table No - 62: Birth Preparedness advice given by ASHAs to Without-Training & With-Training group of Mothers

Birth Preparedness Advice given by ASHA's	Without Training Group (n=400)		With Training Group (n=400)	
	Yes	No	Yes	No
	n (%)	n (%)	n (%)	n (%)
Where to go in case of serious health problems?	333 (83.25)	67 (16.75)	340 (85)	60 (15)
Where you should give birth?	382 (95.5)	18 (4.5)	395 (98.75)	5 (1.25)
Arrangements for Transportation	53 (13.25)	347 (86.75)	398 (99.5)	2 (0.5)
Arrangements for Money	71 (17.75)	329 (82.25)	398 (99.5)	2 (0.5)
Arrangements for Birth Companion	70 (17.5)	330 (82.5)	391 (97.75)	9 (2.25)
Arrangements for Blood Donor	13 (3.25)	387 (96.75)	95 (23.75)	305 (76.25)
Carrying Reports while going for delivery	101 (25.25)	299 (74.75)	206 (51.5)	194 (48.5)

Table No - 62: Before BPCR training of ASHAs, most of the without training group of mothers received advice only regarding which health facility to go in case of serious health problems (83.25%) and where to give birth (95.50%), but most of them did not receive advice regarding arrangement of transportation, money, birth companion, blood donor and carrying reports while going for delivery from ASHAs. After BPCR training of ASHAs, majority of the with training group of mothers received advice regarding the above factors from ASHAs.

Table No - 63: Comparison of Practice scores of Advice given by ASHA on Birth Preparedness between two groups of mothers (without and with training) (n=400 in each group)

Practice	Groups	Mean	SD	SE	t-value	P-value
Advise of ASHA on Birth Preparedness	Without training	26.67	13.14	0.66	46.1603	**<0.001**
	With training	64.42	9.74	0.49		

Table No - 63: Comparison between mothers' practice scores of advice given by ASHA on birth preparedness by Independent t-test showed that mean score of mothers without training was 26.67±13.14 and mothers with training was 64.42±9.74. Mothers with training had significantly high practice score of advice given by ASHA on birth preparedness compared to mothers without training with p-value of <0.001 at 95% CI.

Figure No - 38: Comparison of Practice scores of Advice given by ASHA on Birth Preparedness between two groups of mothers (without and with training)

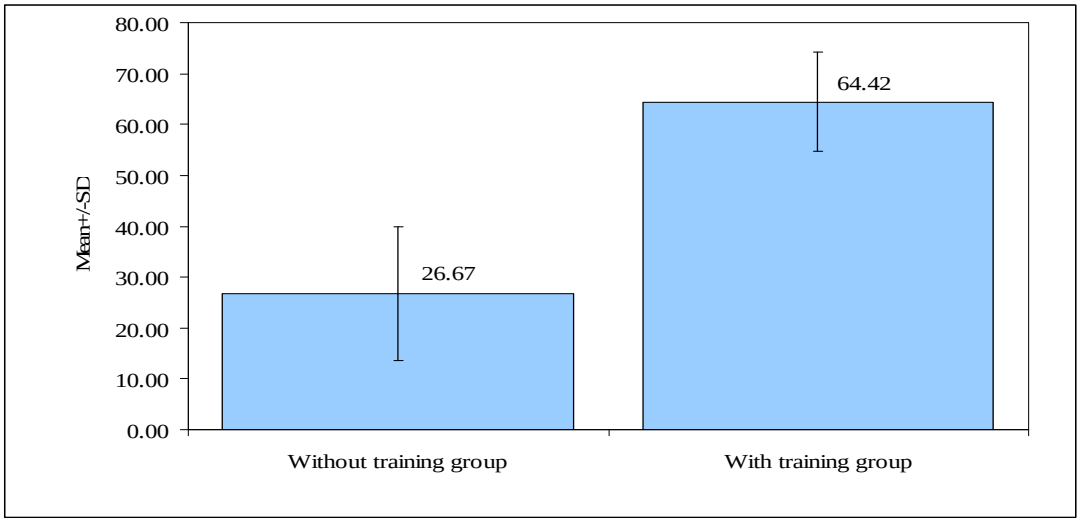


Table No - 64: Comparison of Practice scores of Birth Preparedness between two groups of mothers (without and with training) (n=400 in each group)

Practice	Groups	Mean	SD	SE	t-value	P-value
Practice of Birth preparedness by Mothers	Without training	35.28	13.54	0.68	35.4952	**<0.001**
	With training	63.41	8.23	0.41		

Table No - 64: Comparison between mothers' practice scores of birth preparedness by Independent t-test showed that mean score of practice of mothers without training was 35.28±13.54 and mothers with training was 63.41±8.23. Mothers with training had significantly high practice scores of birth preparedness compared to mothers without training with p-value of <0.001 at 95% CI.

Figure No - 39: Comparison of Practice scores of Birth Preparedness between two groups of mothers (without and with training)

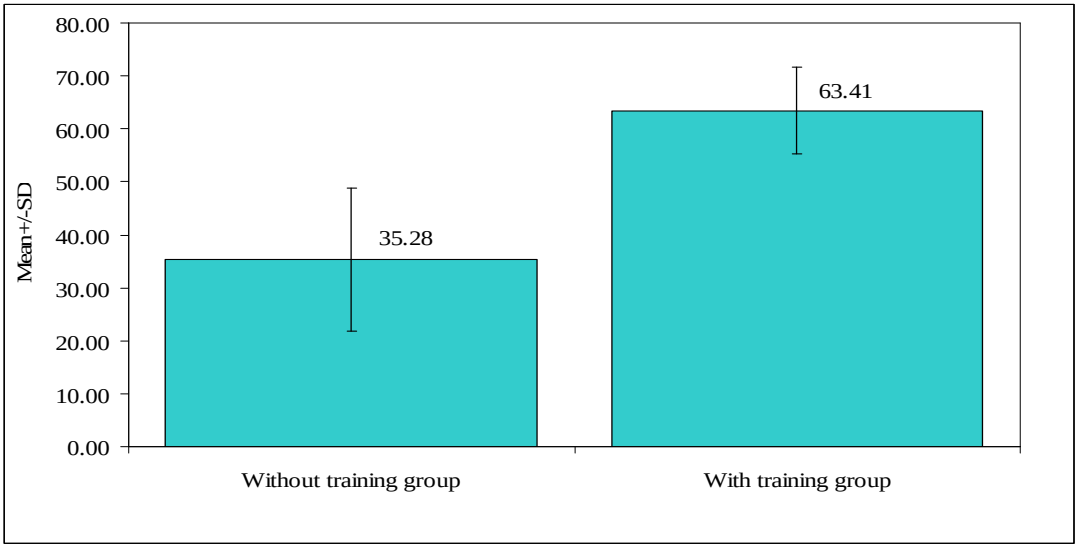
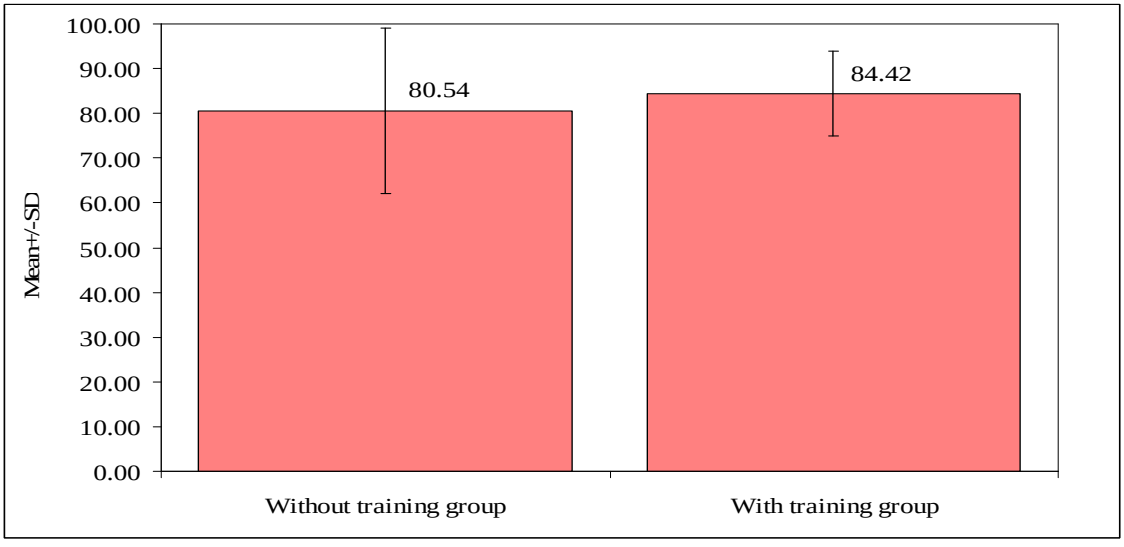


Table No - 65: Comparison of Practice scores of Postpartum Care between two groups of mothers (without and with training) (n=400 in each group)

Practice	Groups	Mean	SD	SE	t-value	P-value
Practice of Postpartum Care	Without training	80.54	18.58	0.93	3.7181	**<0.001**
	With training	84.42	9.45	0.47		

Table No - 65: Comparison between mothers' practice scores of postpartum care by Independent t-test showed that mean score of practice of mothers without training was 80.54±18.58 and mothers with training was 84.42±9.45. Mothers with training had significantly high Practice scores of postpartum care compared to mothers without training with p-value of <0.001 at 95% CI.

Figure No - 40: Comparison of Practice scores of Postpartum Care between two groups of mothers (without and with training)



DISCUSSION

Present study was based on the premise that health education of pregnant women and families regarding BPCR which is a program approach recommended by WHO to include in ANC services, will lead to timely identification of the danger signs and appropriate utilization of health care by avoiding 3 delays and saving the precious lives of both woman and baby. This in turn will lead to reduction in MMR and IMR.

ASHA workers are the key components of grass root level health care system who are also called informally as India's Pink Army. They are the community healthcare workers (CHWs) who have been initiated and mainstreamed through NRHM in 2005 in India. As India is a developing country with highest population and high birth rate, MMR and IMR are high compared developed countries. Hence, primary aim of appointing them was to provide maternal and child health and reduce maternal and child mortalities and morbidities i. e., reduction of MMR and IMR. They act as important facilitators by linking the community and health care system. They are also social activists who bring about important behavior change among the community people towards positive health and contribute for social mobilization. They were mainly appointed to serve maternal and child health but now are given with multiple tasks.

From the previous studies it is evident that performance of ASHA workers is not satisfactory regarding maternal and child health. This may be attributed to lack of monitoring and supervision, lack of appropriate and adequate refresher trainings regularly, dissatisfactory incentives and irregular payment, work burden, more hours of work, unsatisfactory relationships with higher health care workers and supervisors,

lack of adequate transportation facilities, disharmony among ASHA workers, lack of health infrastructure, communication gap among other health care providers, family work burden, etc.

Motivating factors which keep the ASHA going are respect and dignity in her society, job satisfaction, feeling of helping women in need, monetary incentives which supports her family, exposure to new word, learning of many new things related to health and other social factors, refresher trainings which make her more knowledgeable, provision of basic health care to women and children, holding community level meetings, providing health awareness programs, counseling women on nutrition and personal hygiene, moreover saving lives of women and children.

This quasi experimental pre-post study at rural Belagavi, Karnataka was undertaken to assess the feasibility and acceptability of implementing BPCR plan through ASHAs by exploring their knowledge and practice levels of BPCR which is an integral part of antenatal care (ANC). An educational intervention was used to train selected ASHA workers using a BPCR planner. Complications regarding pregnancy, labor and child birth, postpartum period, newborn baby etc. are taught to the participants using lecture through chalk and talk method. ASHA workers were educated regarding counseling of pregnant women and their families regarding BPCR and also taught how to make a birth plan in consultation with them. A birth planner was distributed among them to provide it to the pregnant women in their catchment area and was told to prepare them for birth and to face effectively the complications. Feasibility and acceptability of implementing BPCR was studied by post-test data collection from all ASHAs.

Secondary objective of our study was to assess the effect of ASHA training on mothers' knowledge and practice of BPCR. After undergoing training in BPCR all the ASHAs educated, counseled and prepared a birth plan for each pregnant woman in their area using Birth Planner. They helped them practically in arranging the components of BPCR i. e, identifying – a health facility, referral unit, transportation, funds, blood donor and also motivated them to arrange clean clothes for delivery.

To assess the secondary objective, we collected baseline data from 4 recently delivered mothers under each ASHA before training. Training was imparted to ASHAs. After training, ASHAs educated and trained pregnant women in their area. Endline data was collected from those 4 recently delivered and trained mothers under each ASHA to assess the knowledge and practice of BPCR.

Feasibility and acceptability of implementing the BPCR planner through ASHAs was assessed to know how easy or difficult it was to use the planner among pregnant women and whether they accept the planner for health education, counseling and planning the birth.

There was a significant increase in the findings after the educational intervention in the present study. Knowledge and practice levels of BPCR among ASHAs and mothers increased after the intervention.

Sociodemographic Profile of ASHAs

Age group

The present study in Belagavi, Panda et al (2019) in Odisha and Chavan (2021) in Satara showed that majority of ASHAs fall into the middle-aged category (30-40 and 41-50 years) 64%, 51.72% and 51% respectively. The percentage of

ASHAs in the age group of <30 years varied significantly across the studies. Belagavi and Odisha both reported a lower proportion of younger ASHAs (9% and 2.46%, respectively), while Satara and Uttar Pradesh (2020) had a higher proportion (31% and 65% respectively). This might be influenced by regional differences, recruitment practices, and the attractiveness of the ASHA program to younger women in different areas.[71,74,80]

The role of age among ASHA workers is multifaceted, with both advantages and challenges at different stages of life. A diverse mix of age groups within the ASHA workforce can be beneficial, as it allows for a range of perspectives, experiences, and skills to be brought to bear on the complex challenges of rural healthcare delivery in India. Age can influence how ASHA workers perceive their role within the community. Older workers may see themselves as caregivers or maternal figures, while younger workers may adopt a more peer-like or mentorship role, particularly with younger community members.

Marital Status

The present study, Gujarat (2018) and Karnataka (2015) reported similar percentages of married ASHAs, ranging from 86% to 90%. However, Odisha (2019) had a slightly lower percentage of married ASHAs at 76.92%. The proportion of ASHAs who were either unmarried, divorced, or widowed varied across the studies. Belagavi, Gujarat and Karnataka had a relatively similar percentage of such ASHAs at around 14%, 10.7% and 10.9%, respectively. Odisha had the highest percentage (23.57%) of unmarried, divorced, or widowed ASHAs, indicating greater diversity in marital status compared to other regions.[80,86,98]

Marital status affects how ASHA workers are perceived within traditional rural communities, with married workers often seen as more responsible and mature due to societal norms. Married ASHA workers may find it easier to connect with other married individuals and access households through established social networks, while unmarried workers may face challenges in relating to married community members.

Marital status influences the work-life balance of ASHA workers, with married workers potentially facing challenges in balancing professional responsibilities with household duties and childcare, while unmarried workers may have more control over their time and energy. Divorced or widowed ASHA workers may encounter stigma or discrimination in conservative communities, affecting their acceptance and effectiveness in providing healthcare services.

Type of Family

The present study in Belagavi reported an almost equal distribution between nuclear (53%) and joint (47%) families. A study in Kolar (2021) showed a higher percentage (75.3%) of ASHAs in nuclear families and a study in Vijayapura (2020) indicated an even higher percentage (78.1%) of ASHAs belonging to nuclear families. These differences could be influenced by the socio-cultural norms and practices prevalent in each region.[70,75]

In joint families, ASHAs might benefit from the presence of extended family members who can assist with household tasks, allowing ASHAs to focus more on their community healthcare activities. In contrast, ASHAs in nuclear families may need to rely more on external support systems or community resources to manage their professional and personal responsibilities.

Nuclear Family: ASHA workers from nuclear families may have fewer familial obligations compared to those from extended families. This could allow them more flexibility and time to dedicate to their role, potentially enhancing their availability for community outreach, training sessions, and healthcare interventions.

Joint Family: ASHA workers from joint families may experience both advantages and disadvantages. While they may have a larger support network and shared responsibilities within the household, they may also face challenges related to coordinating schedules and managing conflicts within the family dynamic.

Extended Family: ASHA workers from extended families may have additional responsibilities such as caring for elderly people or participating in family ceremonies. This can impact their availability and ability to respond to community needs promptly. However, they may also benefit from a larger support network within the family, which could help mitigate some of these challenges.

Educational Level

The percentage of ASHAs who completed high school (secondary level) education varied across the studies, with Satara (2021) showing the highest 70% followed by present study at Belagavi 69%, Kolar (2021) 62% and Haryana (2022) showing lowest 51.4%. This suggests that there may be differences in educational infrastructure and opportunities between these regions, impacting the education levels of ASHAs. Studies in Haryana and Kolar showed a higher proportion of ASHAs with undergraduate education (34.3% and 23.3% respectively) compared to the present study in Belagavi (13%) and Satara (5%). This indicates that Haryana and Kolar might have better access to higher education or more initiatives supporting ASHAs' professional development compared to Belagavi and Satara. Satara had the highest

percentage of ASHAs (25%) with middle school education (primary level), followed by Belagavi (18%), Haryana (14.3%) and Kolar (7.3%).[59,70,71]

ASHAs with higher education levels are likely to possess enhanced communication skills, critical thinking abilities and a better understanding of medical information, which can lead to improved healthcare delivery. Regions with a higher percentage of ASHAs with higher education may be better equipped to handle complex healthcare interventions.

ASHA workers with higher levels of education may have a better understanding of healthcare concepts, disease prevention, and treatment protocols. They may also possess stronger communication skills, enabling them to effectively educate community members about health-related issues and promote behavior change.

ASHA workers with higher levels of education may be better equipped to undergo and benefit from training programs offered by healthcare authorities. They may grasp new concepts more quickly, apply them effectively in their work, and serve as peer educators within their communities. Higher levels of education enable them to stay updated on healthcare trends and leverage technological tools for healthcare delivery. Higher levels of education often correlate with improved critical thinking skills, problem-solving abilities, and decision-making capacity.

Families belonging to BPL and APL

In present study majority (76%) of ASHAs belonged to BPL families and only 24% belonged to APL families which shows that majority of ASHAs were from economically vulnerable families.

ASHA workers from BPL backgrounds might have experience with the healthcare challenges faced by economically disadvantaged communities. This can enhance their empathy, understanding, and connection with the people they serve. However, they may also face financial constraints and resource limitations, which can impact their ability to access training, transportation, and necessary supplies for their work.

ASHA workers from APL backgrounds may not have the same level of personal experience with poverty and healthcare disparities. However, they may bring different perspectives and resources to their role, such as better access to education and financial stability. This can enable them to contribute in terms of advocacy, networking, and mobilizing resources within the community.

ASHA workers from BPL backgrounds may find it easier to connect with and gain the trust of economically disadvantaged community members, as they share similar lived experiences. This can facilitate better communication, acceptance, and uptake of healthcare services. Conversely, ASHA workers from APL backgrounds may need to work harder to establish rapport and credibility within these communities.

Experience

The present study in rural Belagavi indicated that a significant majority (78%) of ASHAs had extensive experience with 37 months or more in the role. Other studies revealed considerable variation in the percentage of ASHAs with more than 5 years of experience. Haryana (2022) had the highest proportion of 88.6% of experienced ASHAs, indicating a well-established and stable ASHA program in the region. Satara (2021) followed with 75% experienced ASHAs, while the tribal area of Tamil Nadu

(2019) had the lowest proportion of 57.8%, suggesting potential challenges in retaining ASHAs in this particular area. The higher percentage of ASHAs with less than 5 years of experience in the tribal area of Tamil Nadu (42.2%) may indicate difficulties in retaining ASHAs in this region. Factors such as remote and challenging working conditions, lack of amenities and limited opportunities for professional growth may contribute to higher turnover rates.[59,71,79]

ASHAs with more experience are likely to have better knowledge of the local health issues, established relationships with the community, and improved skills in delivering healthcare services.

Experience plays a crucial role in shaping ASHAs. Experience is a valuable asset that enhances the effectiveness, resilience, and impact of ASHA workers in delivering healthcare services to underserved communities. Experienced ASHA workers often have a deep understanding of the communities they serve, including cultural norms, local healthcare practices, and socio-economic dynamics. This knowledge enables them to build trust and rapport with community members, enhancing the acceptance and uptake of healthcare services.

With experience, ASHA workers often assume leadership roles within their communities, serving as role models, advocates, and mentors for their peers and community members. They can inspire and empower others to take ownership of their health, participate in community health initiatives, and become agents of change.

Training Received

In the present study, a higher percentage (55%) of ASHAs received more than four rounds of training, while in a study in Koppal (2013) which is a poor performing

district, majority (65.7%) of ASHAs received only one round of training. This might indicate potential challenges in delivering regular training sessions to ASHAs in this region, which could be due to resource constraints, logistical issues, or other factors.[107]

Training on Birth Preparedness and Complication Readiness (BPCR) and Maternal and Child Health (MCH) is crucial for enhancing the effectiveness of ASHA workers in promoting maternal and child well-being.

Training equips ASHA workers with essential knowledge about the importance of BPCR and MCH, including recognizing danger signs during pregnancy, childbirth, and postpartum, as well as understanding key interventions for preventing maternal and child morbidity and mortality. Training provides ASHA workers with practical skills and competencies necessary for conducting community-based interventions related to BPCR and MCH. This includes conducting home visits, facilitating antenatal care, promoting institutional deliveries, providing postnatal care, and promoting essential newborn care practices.

Through training, ASHA workers learn how to identify early signs of complications during pregnancy, childbirth, and the postnatal period. They are trained to provide timely referrals to appropriate healthcare facilities for further assessment and management, thereby reducing maternal and neonatal mortality and morbidity. Regular refresher training sessions enable ASHA workers to stay updated on the latest evidence-based practices, guidelines, and innovations in BPCR and MCH. This ensures that they maintain their knowledge and skills and adapt to changing healthcare needs and priorities within their communities.

ASHAs who receive more frequent and updated training are likely to be more confident and competent in dealing with various health challenges in their communities. Consequently, their ability to deliver quality healthcare services and facilitate positive health outcomes might be higher compared to ASHAs who receive fewer rounds of training.

Support Mechanisms and Barriers faced by ASHAs:

In present study almost all (99) of them felt awarded in their role as ASHA. Majority of the ASHAs felt rewarded because of recognition in community (66%), making difference in women's lives (91%), and being able to help others (89%). Majority (91%) of them agreed that support from ANM/AWW during home visit makes it easy to communicate more effectively with pregnant woman and her family members. Similarly, Debbarma et al (2021) study revealed that positive factors influencing ASHAs were job satisfaction, dignity in society, etc.[69] Thomas Thattil at al (2019) in Karnataka found that self-satisfaction, team work and social support motivated ASHAs.[84]

In present study, more workload (90%), less salary (80%), non-cooperation from community people (59%) and delayed salary (22%) were the common barriers or challenges faced by ASHAs. Similarly, studies by Mendhe et al (2022) and Manjunath et al (2022) identified common challenges faced by ASHAs, such as insufficient pay, excessive workload, lack of proper supervision, etc. Majority of the ASHAs were not satisfied with their monthly income. [61,62,64]

Addressing these barriers and bolstering the supportive factors can significantly improve the performance and impact of ASHA workers in delivering essential healthcare services to the underserved communities in India.

Main Variables of the Study

Knowledge of Pregnancy Danger Signs

The present study indicated that there was a significant improvement in total pregnancy danger sign knowledge among participants after the training. The mean score before training (pre-test) was 31.55±15.80, which was relatively low. However, after the training the mean score increased substantially to 73.45±12.64 indicating a significant ($p<0.001$) enhancement in participants' understanding of pregnancy danger signs.

Similarly, in a study by Azarudeen et al (2019), pregnancy danger sign knowledge level improved from 15% to 80% following the training program. These findings highlight the effectiveness of the training interventions in enhancing pregnancy danger sign knowledge among ASHAs. Present study had a higher Pre-test mean score (31.55%), indicating relatively better baseline knowledge compared to the tribal population in Tamil Nadu, where the baseline knowledge was reported to be 15%. This variation might be attributed to differences in the healthcare infrastructure, training resources, and educational support available in two regions.[79]

The present study indicated a higher baseline knowledge level of 31.55% among ASHAs, which may be attributed to more effective and comprehensive training programs in Belagavi. In contrast, the substantially lower knowledge score of 7.2% in Koppal (2013) which is a poor performing district highlighted potential shortcomings in the existing training initiatives for ASHAs in that region.[107]

Relatively higher knowledge score of 54% observed in Satara (2021) compared to Belagavi (31.55%) indicates that the training interventions in Satara had been more successful in equipping ASHAs with the necessary knowledge to identify

and manage pregnancy danger signs. This highlights the importance of well-designed and targeted training initiatives in enhancing ASHAs' capacity to provide better care.[71]

Similarly, Shah et al (2018) mHealth intervention at a tribal area also resulted in a significant increase in knowledge levels, from 69.1% to 75%. These findings highlight the importance of structured interventions in enhancing frontline health workers' capacity to identify and manage pregnancy-related risks effectively. Shah et al (2018) study introduced the use of mHealth technology as an effective means to deliver training and educational content to frontline health workers. The accessibility and flexibility of mobile-based interventions can be particularly advantageous in reaching remote and underserved areas, such as tribal regions. This makes mHealth interventions a promising approach to bridge knowledge gaps in resource-constrained settings.[85]

Sugandha's (2019) study in Mysuru found that 49.5% of ASHAs had knowledge of danger signs during pregnancy. On the other hand, the present study in Belagavi reported a mean pre-test knowledge score of 31.55%, indicating that the majority of ASHAs in Belagavi had relatively lower baseline knowledge levels of pregnancy danger signs. The differences may be influenced by several factors, including variations in the quality and content of training programs, sample size selected, access to educational resources, and the level of support provided to ASHAs in each region.[82]

Knowledge of Antenatal Care (ANC)

In present study, there was a significant ($p<0.001$) improvement in ANC knowledge among ASHAs after the training intervention. The mean pre-test

knowledge score was 71.25±7.04, while the mean post-test knowledge score increased substantially to 99.00±3.80. This increase of 27.75% in Post-test scores suggested that the educational intervention had a substantial positive impact on ASHAs' understanding of ANC practices and guidelines.

In contrast, in Koppal (2013), the ANC knowledge levels were more evenly distributed, with around 50.2% of ASHAs having good knowledge and 49.8% having average knowledge. These disparities may be influenced by variations in training programs, access to educational resources, and healthcare infrastructure in the two regions. The present study's findings indicate that the majority of ASHAs in Belagavi had a high level of ANC knowledge even before the intervention, suggesting the presence of effective training and support systems in the region. Conversely, in Koppal which is a low performing and backward district, around half of the ASHAs had average knowledge, highlighting the need for further interventions and support to improve their ANC knowledge levels.[107]

Similarly, in a study by Azarudeen et al (2019), ANC knowledge level improved from 60% to 100% following the training program. These findings highlight the effectiveness of the training interventions in enhancing ANC knowledge among ASHAs. The two studies reported different baseline ANC knowledge levels among ASHAs. Belagavi had a higher pre-test knowledge score of 71.25%, indicating relatively better baseline knowledge compared to the tribal population in Tamil Nadu (60%). The success of the training interventions in both studies can be attributed to their tailored approaches to address the specific knowledge gaps of ASHAs in each region.[79]

On the other hand, Sugandha's (2019) study in Mysuru found that only 51.5% of ASHAs had knowledge of ANC, indicating a lower proportion of ASHAs with adequate knowledge in Mysuru.[82]

Knowledge of Information provided to Pregnant Women

In present study the significant ($p<0.001$) increase in mean post-test knowledge scores of 97.82±4.68 compared to the mean pre-test scores of 48.73±9.09 indicated that training had a substantial positive effect on information given to pregnant women by ASHAs. The large difference between the mean pre-test and post-test scores suggests a notable enhancement in the information provided to pregnant women.

The present study's mean pre-test score of 48.73% indicated that there was room for improvement in ASHAs' effectiveness in providing information to pregnant women. On the other hand, Sugandha's (2019) study in Mysuru reported that around 78% of the respondents knew about the information given by ASHAs for birth preparedness. This finding suggests a relatively higher level of awareness among pregnant women in Mysuru about essential aspects related to birth preparedness.[82]

Knowledge of Labor and Childbirth Danger Signs

In present study mean pre-test knowledge score was 27.11±12.86, while a significant ($p<0.001$) improvement was seen in post-test score to 53.22±10.39. This increase of 26.11% in post-test scores suggests a notable enhancement in ASHAs' understanding of these critical danger signs of labor and childbirth.

Similarly, in Tamil Nadu (2019) the training intervention resulted in a remarkable improvement, with all (100%) ASHAs acquiring knowledge of labor &

childbirth danger signs after the training. In present study, the pre-test knowledge score was 27.11%, indicating relatively better initial knowledge. In contrast, in Tamil Nadu, only 15% of ASHAs had knowledge of these danger signs before training. This difference in baseline knowledge levels may be influenced by variations in training opportunities, access to educational resources, and the region-specific healthcare context.[79]

Similarly, an interventional study in Andhra Pradesh (2014) also demonstrated a significant increase in knowledge scores of labor & childbirth danger signs from 24.96 ± 6.37 in pre-test to 42.18 ± 8.18 in post-test. Although the magnitude of improvement was slightly lower than that of the present study, it still signifies a considerable enhancement in knowledge levels. Both studies assessed the baseline knowledge levels of labor & childbirth danger signs before implementing any interventions. The mean pre-test knowledge scores in both studies were relatively low, indicating that there was a knowledge gap among participants at the beginning of interventions. Post-test knowledge scores in both studies showed significant improvements compared to pre-test scores, indicating the effectiveness of the interventions in enhancing knowledge.[101]

Knowledge of Birth Preparedness

In present study, the mean pre-test score of birth preparedness was 44.50±14.25, whereas the mean post-test score increased substantially to 87.88±2.78. This significant ($p<0.001$) increase in the post-test score suggests that the training had a positive effect on enhancing the participants' knowledge of birth preparedness.

In contrast, a study in Mysuru (2019) reported that 67.5% of the participants had adequate knowledge of birth preparedness. The higher percentage in Mysuru

study suggested that a greater proportion of participants demonstrated knowledge of birth preparedness compared to present study. The differences in knowledge levels might be attributed to variations in sample characteristics and the contexts of the two studies. Different populations and geographical locations may have varying levels of awareness and access to information about birth preparedness. The socioeconomic, cultural, and educational backgrounds of the participants could influence their knowledge levels.[82]

A study in Jaipur city by Meena et al (2016) reported a high knowledge level of 84.88%, indicating that a large proportion of the participants had a good understanding of birth preparedness. In contrast, present study in Belagavi reported a much lower pre-test knowledge score of 44.50%, suggesting a relatively lower level of knowledge in this rural area among the participants. The variation in knowledge levels may be attributed to differences in the sample characteristics and difference between urban and rural regions of Jaipur and Belagavi. Socioeconomic factors and regional disparities may also play a role in shaping the knowledge gap.[133]

A study by Singh et al (2022) in Northern India reported knowledge level of 65.9%, suggesting that a substantial number of the participants had some understanding of birth preparedness. On the other hand, the present study reported a lower pre-test knowledge score of 44.50%, indicating a relatively lower level of knowledge in this area among the participants.[63]

In the present study, only 15% of the ASHAs were found to have a high-level of knowledge, while 85% had a low level of knowledge. In contrast, Kochukuttan et al (2013) study in Koppal reported a higher percentage (71%) of ASHAs with good knowledge and a lower percentage (27.5%) with poor knowledge. The significant

variation in knowledge levels emphasizes the importance of targeted training and interventions for ASHAs to improve their knowledge regarding birth preparedness. Providing comprehensive and region-specific educational programs can help bridge the knowledge gap and enhance the effectiveness of ASHAs in promoting maternal and child healthcare.[107]

Knowledge of Postpartum Danger Signs

In the present study mean pre-test knowledge score for postpartum danger signs was 27.27±14.15, which significantly increased to 59.27±11.95 in post-test. This significant ($p<0.001$) improvement in knowledge indicates that the intervention had a positive effect on enhancing participants' understanding of postpartum danger signs.

However, in Shah et al (2018) study in tribal areas of Gujarat, knowledge score in both intervention and control groups was 52.4%, which suggested a higher level of baseline knowledge compared to the present study. The impact of the interventions in the two studies was strikingly different. In present study, a significant increase in knowledge levels after educational intervention was seen, with post-test mean score rising to 59.27%. This suggests that intervention demonstrated effectiveness in enhancing participants' understanding of postpartum danger signs. In contrast, in Shah et al (2018) study, the knowledge level did not change significantly after the mHealth intervention, as both the intervention and control arms had similar knowledge scores of 52.4%.[85]

In the present study, 34% of ASHAs had a high-level knowledge, while 66% had low-level knowledge. On the other hand, in Kochukuttan et al (2013) study in Koppal, Karnataka, only 7.2% of ASHAs demonstrated average knowledge, while a

strikingly high percentage of 92.8% had poor knowledge. The variation in knowledge levels could also be influenced by the effectiveness of interventions and training programs in each region. The regions where the studies were conducted may have varying degrees of resources and access to information, influencing ASHAs' knowledge levels.[107]

Knowledge of Postpartum Care

In present study, mean pre-test score for postpartum care for mothers was 30.75±10.72, which increased substantially to 61.13±3.93 in post-test. This significant ($p<0.001$) increase in knowledge scores signifies that intervention's impact was positive and effective on enhancing participants' understanding of postpartum care.

In contrast, Sugandha's (2019) study in Mysuru reported a significantly higher percentage of postpartum care, with 86.1% demonstrating good knowledge. Both studies highlighted the importance of continuous education and awareness programs for healthcare providers and mothers to enhance knowledge about postpartum care practices.[82]

On the other hand, Meena et al (2016) study in Jaipur City reported a much higher knowledge level of 85.46%, indicating that a significant proportion of the participants had good knowledge about postpartum care. The significant difference in knowledge levels suggested that interventions and awareness programs related to postpartum care might have been more effective in Jaipur City, leading to higher knowledge levels among participants compared to present study at rural area.[133]

Knowledge of Baby Care

In the present study, mean pre-test score for baby care after birth was .43.50±10.72, which increased substantially to 95.25±3.93 in the post-test. This significant ($p<0.001$) increase in knowledge scores suggested that intervention was highly positive and effective on enhancing participants' understanding of baby care after birth.

Similarly, Azarudeen et al (2019) study reported a remarkable increase in baby care knowledge from 55% before training to 98% after training of ASHAs. The effectiveness of the respective interventions highlighted the importance of training and capacity-building programs for healthcare providers and ASHAs. Continuous education and training are vital to enhance baby care knowledge and contribute to better maternal and child healthcare outcomes.[79]

Similarly, Shah et al (2018) study reported a significant increase in baby care knowledge from 57% in control group to 75% in intervention group. The studies indicated that both interventions were effective in improving baby care knowledge. However, the magnitude of improvement in present study is notably higher, with post-test knowledge score reaching 95.25%. In contrast, intervention group in Shah et al (2018) study showed a post-test knowledge score of 75%.[85]

Knowledge of Breastfeeding

In present study, mean pre-test knowledge score of breastfeeding among ASHAs was 64.40±10.72, with significant ($p<0.001$) increase in knowledge to 96.40±3.93 in post-test. This indicates that intervention was positive and effective in enhancing ASHAs' understanding of breastfeeding practices.

Azarudeen et al (2019) study reported an even more substantial increase in exclusive breastfeeding knowledge from 63.9% before training to 98.73% after training. Both studies showed a statistically significant improvement.[79]

However, in Shah et al (2018) study, there was no significant change in ASHAs' knowledge of breastfeeding, as both the control and intervention groups had a knowledge score of 94.5%. The present study achieved statistical significance with a p-value of <0.001 at a 95% CI, indicating that the observed improvement in knowledge is unlikely to have occurred by chance. In contrast, Shah et al (2018) study did not report statistical significance as there was no significant change in knowledge scores between the control and intervention groups.[85]

Practice of ANC Service Provision

The present study had a mean pre-test score of 64.38±10.72, which substantially increased to 88.93±3.93 in post-test. The significant ($p<0.001$) increase in post-test scores indicated that the intervention had a high impact on enhancing participants' understanding of ANC service provision. The substantial increase in post-test knowledge scores by approximately 24.55% suggests that the intervention's content and delivery methods were successful in educating participants about ANC services.

Similarly, Karol et al (2014) study in Rajasthan found that ASHAs' practice of ANC service was 67.33%. Both scores are relatively close, suggesting a similarity in the baseline knowledge or practice levels related to ANC services among ASHAs in these regions.[102]

Shukla and Bhatnagar (2012) study in Uttarakhand found that ASHAs provided ANC services at a rate of 69.7% which was similar to present study. The similarity in these scores suggests that ASHAs play an active role in delivering ANC services in both regions. Comparing the practices of ASHAs in different regions, such as Karnataka and Uttarakhand, can facilitate the sharing of best practices and strategies to further improve ANC service delivery.[113]

Practice of Birth Preparedness Services

In present study, pre-test practice score was 46.12±10.72, which increased significantly ($p<0.001$) to 99.18±3.93 in post-test. The intervention had a remarkable impact on enhancing ASHAs' ability to provide birth preparedness services effectively. The substantial increase in post-test practice scores by 53.06% indicates the success of the intervention.

A systematic review conducted by Maryuni (2022) focused on BPCR practice in rural areas of developing countries. The overall BPCR practice ranged from 32.78% to 61.8%, suggesting a wide variation in adherence to BPCR guidelines across different settings and countries. This wide range of results highlighted the heterogeneity in BPCR practices and indicated that there might be various factors influencing the effectiveness of BPCR services in rural areas of developing countries. The systematic review approach allows for a broader perspective on the topic, drawing data from multiple studies, but it also presents challenges in terms of standardization and comparability due to the diverse settings included.[50]

The present study reported a lower pre-test practice score of 46.12%, while Singh et al (2022) study in Northern India found a higher practice score of 65.9%. This variation suggests regional disparities or differences in healthcare practices and

interventions. One possible reason for the variation in practice levels could be the effectiveness of the interventions or training programs provided to ASHAs in each region.[63]

Similar to the present study, Kari and Angolkar (2021) study found a practice score of 49.1%. This suggests that ASHAs in this region demonstrate comparable practice levels for birth preparedness services. Local factors can influence the effectiveness of interventions and capacity-building initiatives for ASHAs.[11]

Levels of BPCR Knowledge and Practice among ASHAs

Before BPCR training, the distribution showed that a majority (60-80%) of ASHAs had a moderate level (Mean±SD) of knowledge and practice scores, with a smaller proportion of 10-20% having low level (Mean-SD) and 10-20% having high level (Mean+SD). This indicates a baseline where a significant portion of ASHAs had room for improvement in their BPCR skills. Post-training, there was a remarkable shift in BPCR knowledge and practice levels, approximately 90-100% of ASHAs attained a high level of knowledge and practice scores, with only around 10% remaining at a moderate level. This suggests that the training program effectively elevated the competency levels of ASHAs in BPCR.

This improvement is crucial as it indicates enhanced preparedness among ASHAs to handle birth-related complications and provide better care to pregnant women. It also reflects positively on the effectiveness of the training curriculum and methodologies employed. However, it's essential to consider on-going support and reinforcement of these skills to ensure sustained proficiency over time.

Association of sociodemographic factors with BPCR Knowledge and Practice among ASHAs

A community-based study conducted by Joseena (2020) at Kerala found that educational status had a noteworthy correlation with knowledge scores. Similarly, in present study also we found an association between knowledge scores and educational status.[126]

A study on 80 ASHAs at Gujarat by Bhanderi et al (2018) found that there was an association between ASHAs performance and last training received. Kochukuttan et al (2013) study findings at rural Karnataka also revealed that knowledge was significantly associated with recent and repeated training of ASHAs. Similar findings were observed in present study.[86,107]

Similarly, a systematic review by Solnes Miltenburg et al (2017) revealed that an intervention at both community level and facility level improved the utilization of health care system at birth. Higher education level was positively associated with improved BPCR levels and better results.[53]

An interventional study on 130 ASHAs at Andhra Pradesh by Renuka et al (2014) revealed that ASHAs with higher education and more age had higher pre-test score. Similar findings were observed in present study.[101]

Effect of ASHA training on Mothers' Knowledge and Practice of BPCR

Based on findings of present study, it can be inferred that training of Accredited Social Health Activists (ASHAs) had statistically significant and positive impact on improving Mothers' knowledge and practice of BPCR. Findings suggest that the intervention of providing training to ASHAs effectively empowered them

with necessary knowledge and skills to educate and support expectant mothers in their communities. This improvement in knowledge and practice could potentially lead to better birth outcomes and increased readiness to handle complications during childbirth, thereby contributing to the overall improvement of maternal and neonatal healthcare in the studied population.

A systematic review conducted to evaluate status of BPCR among pregnant women in Ethiopia by Berhe et al (2018) revealed that 32% of the women were adequately ready for childbirth, in present study 35.28% women were adequately ready, which was almost similar. Around 26.33% of expectant mothers were knowledgeable about warning signs during pregnancy but in present study only 4.5% were knowledgeable, which was in contrast.[129]

A systematic review by Solnes Miltenburg et al (2015) to assess the effect of BPCR interventions revealed that in majority of the studies following intervention, a rise in BPCR knowledge was seen. Similarly, in present study also there was a rise in BPCR knowledge in training group.[130]

A quasi-experimental study was carried out in Uttar Pradesh, India by Baqui et al (2008) to provide BPCR counseling to pregnant women and their families. Intervention district demonstrated enhanced coverage in all essential newborn care indicators. Similarly, in present study also new born care knowledge & practices improved significantly in intervention group of women.[123]

A cluster-RCT in Uttar Pradesh by Kumar et al (2012) revealed improvements in birth preparedness, umbilical cord care, and breastfeeding in intervention arm.

Similarly, in present study there was significant improvement in BPCR and baby care among intervention group.[115]

A study carried out on 385 postpartum mothers by Izudi et al (2019) showed health education regarding BPCR notably led to a significant increase in SBA utilization, but it did not show the same effect on early postnatal care (EPNC) utilization. On the contrary, in present study health education on BPCR increased practice of BPCR as well as PNC.[131]

Cross-sectional studies conducted in Indore City by Agarwal et al (2010), Udupi taluk by Gurung et al (2017), rural Rwanda by Kalisa et al (2018) revealed that 20-50% of expectant mothers were adequately ready for delivery. In present study 35.28% of expectant mothers were adequately ready for childbirth.[27,78,128]

A study was carried out in South Wollo, Northwest Ethiopia by Bitew et al (2016) found that only 24.1% expectant mothers were adequately ready for delivery, in present study 35.28% were prepared. Pregnant women's knowledge of pregnancy, delivery, and postnatal danger signs were 23.2%, 22.6% and 9.6%, respectively, but in present study it was 5.95%, 4.78% and 4.23% respectively which was very low.[132]

SUMMARY

- In developing nations, maternal mortality poses a significant challenge, impacting the lives of countless women. According to WHO, approximately 300 million women in these regions experience various health issues due to pregnancy and childbirth, whether short-term or enduring. To address this concern, WHO recognizes BPCR as a crucial component of the ANC package. In this context, ASHA workers assume a pivotal role in providing healthcare support to expectant mothers within their local communities. However, their knowledge and practice of BPCR might be insufficient to address potential complications during pregnancy and childbirth.

- Current study was undertaken to assess the feasibility and acceptability of Birth BPCR plan by ASHAs and to evaluate the effect of BPCR training of ASHAs on knowledge & practice of BPCR among pregnant women.

- A Quasi-Experimental Pre-Post design was used in rural region of Belagavi Taluka. All ASHAs of 1 CHC and 2 PHC were included in the study. Recently delivered mothers under the catchment area of ASHAs were included to assess the effect of training of ASHAs.
- Baseline (Pre-test) data was collected from ASHAs and Mothers through interview using a standard tool by JHPIEGO to assess the baseline knowledge and practice of BPCR.
- Intensive and meticulous training was provided to ASHAs using a Birth Planner regarding knowledge and practice of BPCR. ASHAs trained pregnant women of their catchment area regarding BPCR using Birth Planner.

- Endline (Post-test) data was collected from both ASHAs and mothers. The data was entered and analyzed using SPSS version 22. Both descriptive and inferential statistics were employed during the analysis process.
- At the outset, both ASHA workers and mothers exhibited low levels of knowledge and practice of BPCR. However, after undergoing the intense training and health education interventions, a significant ($p<001$) improvement was found in their scores.
- Pre-test mean knowledge scores of ASHAs regarding pregnancy, labor and childbirth, postpartum danger signs were 31.55%, 27.11%, 27.27% respectively which increased significantly to 73.45%, 53.22%, 59.27% after intervention (post-test).
- Pre-test mean knowledge and practice scores of ASHAs regarding ANC were 71.25% and 64.38%, which increased significantly in post-test to 99% and 88.93%
- Pre-test birth preparedness knowledge of ASHAs was 44.50% which increased to 87.88% in post-test. Practice scores (%) of Birth Preparedness services increased from46.12% (pre-test) to 99.18% post-test.
- After the training ASHAs helped in birth preparedness of pregnant women by – identifying the health facility for delivery and emergency, identifying referral units for complications, identifying transportation, helping in emergency funds, accompanying pregnant women for delivery as birth companion, and identifying an appropriate blood donor for emergency.
- ASHAs felt motivated because of their dignity and respect in the community and support from the community. They had job satisfaction because they were

able to bring positive changes in pregnant woman's life and help the needy people.

- The main barriers for their performance were irregular and insufficient incentives, inadequate trainings, inadequate supply of essential materials and insufficient health care facilities.
- ASHAs accepted the Birth Planner as an useful tool in training and educating pregnant women and family members and making a birth plan effectively. They accepted that the tool was appropriate and easy to use.
- The effect of ASHA training was assessed through mothers' knowledge and practice of BPCR which increased significantly. Baseline knowledge scores of pregnancy, labor and childbirth, postpartum danger signs were 5.95%, 4.78%, 4.23% respectively among the mothers who were not trained, but knowledge scores increased to 26.36%, 17.81%, 16.87% respectively among trained mothers.
- Baseline ANC knowledge and practice in mothers without training were 47.39% and 61.30%, respectively, endline scores among trained mothers increased to 57.98% and 72.43%.
- Baseline birth preparedness knowledge and practice in mothers without training were 28.94%, 35.28% respectively, endline scores among trained mothers increased to 68.31% and 63.41%.
- ASHAs education and training were found to have a positive correlation with knowledge and practice.

CONCLUSION

Present study focused on assessing the feasibility and acceptability of implementing BPCR plans through ASHAs in a rural region of Belagavi Taluka. The findings revealed that both ASHA workers and mothers initially had low levels of knowledge and practice regarding BPCR. However, after receiving intense training and health education interventions using a Birth Planner, a significant improvement was seen in their knowledge and practice scores. Study highlighted the importance of BPCR as an essential element in antenatal care and significance of incorporating intense training and health education interventions into existing MCH programs.

Through proper birth preparation and readiness for possible complications, the three stages of delays in decision of seeking care, accessing a health facility, and receiving suitable treatment can be minimized. As a result, this contributes to lowering maternal and neonatal health issues and fatalities. By implementing BPCR plans through ASHAs, healthcare systems can take a significant step towards achieving better preparedness and care for childbirth complications, thus contributing to the overall well-being of mothers and infants.

ASHA cadre in India holds significant promise in addressing the issue of high maternal mortality, given their vast numbers, youthful age, high motivation, and grassroots presence. However, the current state of affairs indicates that even the most motivated ASHAs may not be able to effectively save maternal lives due to inadequate training, lack of key knowledge and skills, and insufficient support from the health system. To maximize the potential impact of ASHAs in reducing maternal mortality, urgent action is required to provide appropriate training within a supportive and functioning health system.

Policymakers and healthcare providers should consider integrating BPCR initiatives into their strategies to achieve sustained improvements in birth outcomes and overall healthcare quality. This includes regular refresher training and supervision of ASHAs and providing regular and sufficient incentives to overcome barriers and enhance their performance.

The results of this study serve as valuable evidence for health systems in developing countries, guiding them to prioritize the training and empowerment of frontline healthcare workers like ASHAs and enhancing community-based maternal healthcare services. It is hoped that the findings will contribute to the global effort to reduce maternal mortality and improve the health and well-being of mothers and their newborns, ultimately moving closer to achieving Sustainable Development Goals related to MCH.

FUTURE SCOPE

1. **Follow-Up Studies:** Conducting follow-up studies after a certain period (e.g., six months or one year) to assess implementation of BPCR plan and re-evaluate the knowledge and practice of BPCR among ASHA workers and recently delivered mothers. By doing so, we can determine if the improvements in BPCR scores are sustained over time or if there is any decline in knowledge and practice.

2. **Comparative Studies:** Conducting comparative studies between the intervention group (ASHA workers who received intense training and health education) and a control group (ASHA workers without interventions) would help in determining the direct impact of the interventions by comparing the changes in knowledge and practice scores between the two groups.

3. **Maternal and Neonatal Health Outcomes:** Assessing outcomes such as MMR, neonatal mortality rates, IMR, and other birth-related complications, after the implementation of the interventions can help in establishing a direct correlation between the improvements in BPCR knowledge and practice and the actual health outcomes.

4. **Dissemination of Findings:** Publishing the study's findings in peer-reviewed journals and sharing the results with relevant stakeholders, including policymakers, healthcare professionals, and non-governmental organizations would raise awareness about the importance of BPCR interventions and encourage evidence-based decision-making in maternal and child health programs.

LIMITATIONS

1. **Limited Generalizability:** Current study was conducted within a particular geographic region, which could restrict its applicability to a broader population with different socio-cultural contexts and healthcare systems. The effectiveness of the intense training and health education interventions may vary in diverse settings.

2. **Lack of Control Group:** Due to the lack of a control group in study design, it becomes difficult to attribute the improvements solely to intense training and health education interventions. Without a control group, it is difficult to rule out the influence of other factors or interventions that could have contributed to the observed changes.

3. **Short-Term Evaluation:** The study's design, with pre- and post-intervention assessments, provided valuable information about the immediate impact of the training and health education. However, it does not offer insights into the long-term sustainability of the improvements or the potential waning of the intervention's effects over time.

4. **Limited Outcome Measures:** The study primarily focused on assessing knowledge and practice scores related to BPCR. While these are important indicators, they might not capture full impact of interventions on MCH outcomes.

5. **Recall Bias:** Since study involved recently delivered mothers, there could be a recall bias in their responses, particularly if they were asked to recall events and actions that occurred during childbirth.

RECOMMENDATIONS

1. **Continued Intense Training and Health Education:** The study demonstrated that intense training and health education significantly improved the BPCR knowledge and practice of ASHAs and pregnant women. Therefore, it is recommended to continue providing regular and comprehensive training sessions to ASHAs and use tools like the BPCR planner to educate pregnant women. Training should cover various aspects of BPCR, including identifying danger signs, birth planning, and emergency preparedness.

2. **Incorporate BPCR into Maternal and Child Health Programs:** Policymakers and healthcare providers should integrate BPCR training and health education into existing maternal and child health programs. This would ensure that all pregnant women and ASHA workers receive the necessary knowledge and skills to deal with potential birth complications effectively.

3. **Community-Based Awareness Campaigns:** Community-level awareness campaigns should be conducted to emphasize the importance of BPCR. These campaigns can involve community leaders, local healthcare workers, and other stakeholders to promote the understanding and practice of BPCR among pregnant women and their families.

4. **Monitoring and Evaluation:** Regular monitoring and evaluation of the effectiveness of the training and health education interventions are essential. By assessing the impact of these interventions over time, adjustments can be made to improve their outcomes continually.

5. **Incentives and Recognition:** Recognizing the efforts of ASHA workers in promoting BPCR and providing incentives for their active involvement in improving maternal and child health can enhance their motivation and commitment.

6. **Peer-to-Peer Learning:** Encourage peer-to-peer learning among ASHAs and pregnant women to reinforce BPCR knowledge and practice. Establishing support groups or networks can facilitate the exchange of experiences and best practices.

7. **Accessible and Equitable Healthcare Services:** Ensuring access to quality healthcare services, especially emergency obstetric care, is vital for effective BPCR. Efforts should be made to improve healthcare infrastructure and reduce geographical barriers to healthcare facilities.

8. **Mobile Health Technology:** Utilize mobile health (mHealth) technology to disseminate BPCR information and reminders. Mobile apps and SMS-based platforms can be used to provide ongoing support and reinforcement of BPCR practices.

9. **Research and Data Collection:** Further research should be encouraged to explore the long-term impact of BPCR interventions on maternal and child health outcomes.

10. **Collaboration and Partnerships:** Collaboration between government agencies, non-governmental organizations, and other stakeholders is essential for the successful implementation of BPCR interventions. Pooling resources and expertise can lead to more effective and sustainable outcomes.

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ANNEXURES

ANNEXURE I – Ethical Clearance Certificate

KLE ACADEMY OF HIGHER EDUCATION AND RESEARCH
(Formerly known as KLE University)
(Deemed-to-be-University established u/s 3 of the UGC Act, 1956)
Accredited 'A' Grade by NAAC (2nd Cycle) Placed in Category 'A' by MHRD (GoI)
JNMC Campus, Nehru Nagar, Belagavi-590 010, Karnataka State, India
☎: 0831-2444444 FAX: 0831-2493777 Web: http://www.kledeemeduniversity.edu.in E-mail: info@kledeemeduniversity.edu.in

Ref.No.KAHER/EC/19-20/2906/9002 — 28th June 2019

To,
Dr. Annapurna Kari
Part-Time Ph.D. Research Scholar,
2017-18 Batch, Faculty of Medicine,
KAHER, Belagavi.

Dear Research Scholar

The KAHER Ethics Committee on Human Subjects for Ph.D. Research Project met on 14th **May 2019** to consider your application for approval of the research project **"Feasibility and Acceptability study of implementing Birth preparedness and complication readiness plan through ASHA's - A Health System Research."**

As there are no ethical issues involved in your proposed research project, the committee has provided approval for this research project.

You are requested to report to Ethical Committee of the following:

1. Any deviation from or change of the protocol.
2. Any changes in study documents.

(Dr. Anita Dalal)
Member-Secretary
Ethical Committee (Human) for Ph. D. Research
KAHER, Belagavi.

(Dr. B.C. Kotintot)
Chairman
Ethical Committee (Human) for Ph. D. Research
KAHER, Belagavi.

CC to: - The Director Research Foundation, KAHER, Belagavi.
- The Director Academic Affairs, KAHER, Belagavi.
- The Registrar, KAHER, Belagavi.
- Special Officer to Hon. Vice Chancellor, KAHER, Belagavi.

ANNEXURE II – Informed Consent Form – ASHAs

KLE Academy of Higher Education and Research, Belagavi

Informed Consent Form - ASHAs

Feasibility and Acceptability Study of Implementing Birth Preparedness and Complication Readiness Plan through ASHAs – A Health System Research

Investigator: Dr. Annapurna Kari **Guide:** Dr. Mubashir Angolkar

Objective: To assess feasibility and acceptability of Birth Preparedness and Complication Readiness plan by ASHAs.

Introduction: Every pregnant woman faces the risk of sudden, unpredictable complications that could end in death or injury to herself or to her infant. Pregnancy-related complications cannot be reliably predicted. Interrelated sociocultural factors which delay care-seeking and contribute to deaths are delay in - identifying complication and deciding to seek care, identifying and reaching a health facility, and receiving adequate and appropriate treatment at the health facility. BPRC is an intervention, included by WHO as an essential element of the antenatal care package, to improve the use and effectiveness of key maternal and newborn health services. It encourages pregnant women, their families and communities to effectively plan for births and deal with emergencies. Hence, this study is planned to assess feasibility and acceptability of Birth Preparedness and Complication Readiness plan by ASHAs. You are being invited to participate in this study titled, "Feasibility and Acceptability Study of Implementing Birth Preparedness and Complication Readiness Plan through ASHAs – A Health System Research".

Explanation of Procedure: Training on implementing Birth Preparedness and Complication Readiness (BPCR) plan will be provided to all ASHAs. Pictorial booklets and pamphlets on Birth Plan will be distributed to you which will help you to promote key maternal and neonatal health practices and to educate pregnant woman and her family members regarding BPCR plan. You will be implementing BPCR Plan among pregnant women of your catchment area. After 3 months of training, you will be checked for retention of knowledge and you will be retrained. After one year of training you will be again interviewed to assess the Feasibility and Acceptability of implementing BPCR Plan among pregnant women and associated factors.

Withdrawal of Participants: Your participation in this study will be voluntary. You are free to decide whether to participate or not in the study. In case you decide not to participate in the study, you will be able to withdraw your participation.

Possible Benefits: You will not be assured any benefits but will come to know the pregnancy related complications and importance of BPCR plan.

Possible Risk: There will not be any risk involved in this study. This collected data will be used for research purposes only.

Privacy and Confidentiality: Your identity will not be revealed. All the information collected will be coded so that no one will know your identity. The data collected from you will be kept confidential and only aggregated data will be published.

Financial Incentives: You will not receive any payment towards your participation in this study.

Authorization of Publication: Results of this study may be published for scientific purposes and/or presented to scientific groups; however you will not be identified.

Question: If you have any questions about the study, you should contact **Dr. Annapurna Kari** (Lecturer, Department of Public Health, JNMC, Nehru Nagar, Belagavi) Mobile no- **9741050994** or you may contact **Dr. Mubashir Angolkar** (Asso. Prof & I/C HOD, Department of Public Health, JNMC, Nehru Nagar, Belagavi) Mobile no- **09886983624**. If you have any question about your right as a study participant, you may contact **Dr. A. P. Hogade** MD, Chairperson, Institutional Ethical Committee, JNMC, KAHER, Belagavi, at phone line – 0831-2473777 Extension - 4052

Legal Rights:

By signing this consent form, we are not waving any of your legal rights.

Consent Statement

I am making a voluntary decision to participate in the study. My signature below indicates that I have decided to participate and I have read the information provided above (or the information provided above has been read to me) and I was given the opportunity to ask questions and that they have been answered to my satisfaction.

Name of the Participant: **Signature of the Participant:**

Or left thumb impression:

Name of the Witness: **Signature of the Witness:**

Name of the Researcher: **Signature of the Researcher:**

Date: **Place:**

ANNEXURE II – Informed Consent Form – Mothers

KLE Academy of Higher Education and Research, Belagavi

Informed Consent Form - Mothers

Feasibility and Acceptability Study of Implementing Birth Preparedness and Complication Readiness Plan through ASHAs – A Health System Research

Investigator: Dr. Annapurna Kari **Guide:** Dr. Mubashir Angolkar

Objective: To study the Effect of training ASHAs on Birth Preparedness and Complication Readiness (BPCR) plan by pregnant women.

Introduction: Every pregnant woman faces the risk of sudden, unpredictable complications that could end in death or injury to herself or to her infant. Pregnancy-related complications cannot be reliably predicted. Interrelated sociocultural factors which delay care-seeking and contribute to deaths are delay in - identifying complication and deciding to seek care, identifying and reaching a health facility, and receiving adequate and appropriate treatment at the health facility. BPRC is an intervention, included by WHO as an essential element of the antenatal care package, to improve the use and effectiveness of key maternal and newborn health services. It encourages pregnant women, their families and communities to effectively plan for births and deal with emergencies. Hence, this study is planned to assess the Impact of Birth Preparedness and Complication Readiness plan. You are being invited to participate in this study titled, "Feasibility and Acceptability Study of Implementing Birth Preparedness and Complication Readiness Plan through ASHAs – A Health System Research".

Explanation of Procedure: In this study, an interview will be conducted. It will last for approximately 20 to 30 minutes.

Withdrawal of Participants: Your participation in this study will be voluntary. You are free to decide whether to participate or not in the study. In case you decide not to participate in the study, you will be able to withdraw your participation.

Possible Benefits: You will not be assured any benefits but will come to know the pregnancy related complications and importance of BPCR plan.

Possible Risk: There will not be any risk involved in this study. The interview will only be used for the sake of information regarding BPCR by mothers of study area.

Privacy and Confidentiality: Your identity will not be revealed. All the information collected will be coded so that no one will know your identity. The data collected from you will be kept confidential and only aggregated data will be published.

Financial Incentives: You will not receive any payment towards your participation in this study.

Authorization of Publication: Results of this study may be published for scientific purposes and/or presented to scientific groups; however you will not be identified.

Question: If you have any questions about the study, you should contact **Dr. Annapurna Kari** (Lecturer, Department of Public Health, JNMC, Nehru Nagar, Belagavi) Mobile no- **9741050994** or you may contact **Dr. Mubashir Angolkar** (Asso. Prof & I/C HOD, Department of Public Health, JNMC, Nehru Nagar, Belagavi) Mobile no- **09886983624**. If you have any question about your right as a study participant, you may contact **Dr. A. P. Hogade** MD, Chairperson, Institutional

Ethical Committee, JNMC, KAHER, Belagavi, at phone line – 0831-2473777 Extension - 4052

Legal Rights:

By signing this consent form, we are not waving any of your legal rights.

Consent Statement

I am making a voluntary decision to participate in the study. My signature below indicates that I have decided to participate and I have read the information provided above (or the information provided above has been read to me) and I was given the opportunity to ask questions and that they have been answered to my satisfaction.

Name of the Participant: **Signature of the Participant:**

Or left thumb impression:

Name of the Witness: **Signature of the Witness:**

Name of the Researcher: **Signature of the Researcher:**

Date: **Place:**

ANNEXURE III – Questionnaires

Interview Schedule for ASHAs

'Feasibility and Acceptability study of Implementing Birth Preparedness and Complication Readiness Plan through ASHAs – A Health System Research'

Identification No ----------

District ----------

Block/PHC/CHC ----------

Village ----------

Name of the sub centre ----------

Start Time…….. End Time…….....Date…..……

General Information of ASHA

Q. No.	Question		Options	Code
1.	Name:			
2.	Age	1. 2. 3. 4.	< 30 years 30-39 years 40-49 years > 50 years	
3.	Current Marital Status	1. 2. 3. 4. 5.	Single Married Widowed Divorced Separated	
4.	Religion	1. 2. 3. 4.	Hindu Muslim Christian Others	

5.	Highest level of Education	1. 2. 3. 4. 5.	Primary Secondary Undergraduate Graduate Post-graduate	
6.	Highest level of Education of Husband	1. 2. 3. 4. 5.	Primary Secondary Undergraduate Graduate Post-graduate	
7.	Occupation of the Husband	1. 2. 3. 4. 5.	Service Worker Skilled Worker Agricultural Worker Self Employed Elementary-Unskilled Labourer	
8.	Total family income per month			
9.	Family belongs to	1. 2.	BPL APL	
10.	House hold Structure	1. 2. 3.	Nuclear Joint Extended	
11.	Number of family members			
12.	Number of living Children	1. 2.	Male…… Female……	
13.	Since when are you working as ASHA?	1. 2. 3. 4.	6 – 12 months 13 – 24 months 25 – 36 months > 36 months	
14.	How many rounds of training have you received?	1. 2. 3. 4.	1 round 2 rounds 3 – 4 rounds > 4 rounds	
15.	Did you receive any training in the last 3 months?	1. 2.	Yes No	

Pregnancy Related – Knowledge

1.	Can unforeseen problems related to pregnancy occur during any pregnancy or childbirth that could endanger the life of a woman?	1. 2. 3.	Yes No Don't know	
2.	What are some serious health problems that can occur during pregnancy that could endanger the life of a pregnant woman?	**Key Danger signs** 1. Severe bleeding 2. Swollen hands/face 3. Blurred vision 4. High BP	**Other Danger signs** 1. Severe headache 2. High fever 3. Loss of consciousness 4. Difficulty breathing 5. Severe weakness 6. Severe abdominal pain 7. Convulsions 8. Water breaks without labor 9. Accelerated/ reduced fetal movements 10. Other (Specify)……	
3.	In your opinion could a woman die from any of above-mentioned problems?	1. 2. 3.	Yes No Don't know	

4. What are the Components of Antenatal Care (ANC)?

	Options	**Components of ANC**		
1.	Early registration			
2.	Regular weight check			
3.	Blood test for Anaemia			
4.	Blood test for HIV/AIDS			
5.	Urine test for protein and sugar			
6.	Measuring blood pressure (BP)			
7.	IFA tablets for 3 months			

8.	Two doses of TT injection			
9.	Nutrition education			
10.	Hygiene education			
11.	Birth preparedness			
12.	Complication Readiness			
13.	Ultrasonography (USG)			
14.	Blood test for Sugar (RBS)			
15.	Thyroid test (TSH)			
16.	Blood test for Hepatitis (HbsAg)			
17.	Syphilis Test (VDRL)			
	6. What information do you provide when you visit pregnant woman and their families?			
1.	All the pregnant women are at risk of developing pregnancy related complications.			
2.	Maternal complications are unpredictable but are treatable.			
3.	Importance and Components of ANC visits.			
4.	Signs and symptoms of complications during pregnancy, child birth and postpartum period.			
5.	Birth preparedness plans Eg; Nearby health facility to deliver, birth companion, saving money for delivery/complications, identification of transport, contingency plans in the event of complications etc.			
6.	Family planning (Contraceptive) methods.			
7.	Other (Specify)……			
7.	When should a pregnant woman register for Antenatal Checkup (ANC)?	1. 2. 3.	1st trimester 2nd trimester 3rd trimester	
8.	How many Antenatal Checkups (ANC) should a pregnant woman have?	1. 2. 3.	Three Four > Four	

Labor and Childbirth – Knowledge

1.	What are some serious health problems that can occur during Labor and Childbirth?	**Key Danger Signs** 1.Severe vaginal bleeding 2. Prolonged labor (>12 hours) 3. Convulsions 4. Retained placenta beyond 30 minutes 5. High BP	**Other Danger Signs** 1.Severe headache 2. High fever 3. Loss of consciousness 4. Other (Specify)…….	
2.	In your opinion could a women die from any of the above mentioned problems?	1. 2. 3.	Yes No Don't know	
3.	What are some things a woman can do to prepare for birth?	1. Identify health facility 2. Identify skilled provider 3. Identify mode of transportation 4. Save money for delivery/complications 5. Identify birth companion 6. Identify blood donor 7. Prepare clean items for birth 8. Others (Specify)……		

Postpartum Care – Knowledge

1.	What are some serious health problems that can occur during the first 2 days after birth that could endanger the life of the woman?	**Key Danger Signs** 1. Severe vaginal bleeding 2. Malodorous vaginal discharge 3. High fever 4. Convulsions 5. High BP	**Other Danger Signs** 1. Severe headache 2. Blurred vision 3. Loss of consciousness 4. Difficulty breathing 5. Severe weakness 6. Swollen hands/ face 7. Other (Specify)……	
2.	In your opinion could a woman die from any of the above-mentioned problems?	1. 2. 3.	Yes No Don't know	

3.	Could you name some types of basic care that can be provided to a newborn baby immediately after birth?	1. 2. 3. 4. 5.	Early breastfeeding (within 1 hour) Exclusive breastfeeding Dry and wrap Cord care Other (Specify)……	
4.	How many times should a mother have postpartum checkup after childbirth?	1. 2. 3. 4. 5. 6.	Once at 3 weeks Once at 6 weeks 3 times: at 6 hours, 6 days and 6 weeks Any time she has danger signs Only if she has danger sign Other (Specify)…….	
5.	During postpartum visit what would you advise the mother?	1. 2. 3. 4. 5.	Rest for at least 6 weeks Eat more nutritious food Exclusive breastfeeding for 6 months Need for contraception methods Others (Specify)……..	
6.	What things would you advise regarding baby care after childbirth?	1. 2. 3. 4. 5.	Dry the baby and keep the baby warm Delay first bath for the baby for at least 6 hours Cord care Others (Specify)…….	
7.	What things would you advise regarding breastfeeding?	1. 2. 3. 4. 5.	Start breastfeeding within 1 hour after birth Exclusive breastfeeding for 6 months Breastfeed as and when the baby needs it. Correct position for breastfeeding. Others (Specify)……..	

Antenatal Care Service Provision

1.	What is the actual provision of services by you to pregnant women?	**1. Antenatal care Service**			
			Actual provision		
		1. Helping in registration for ANC services / JSY scheme.			
		2. Calculating date of delivery			
		3. Providing home visits			
		4. Helping with at least 4 ANC checkups.			
		5. Facilitating TT injections.			
		6. Providing Iron/Folate tablets			
		7. Escorting them to village health day			
		8. Get nutrition supplements from Anganwadi centre.			
		9. Advising them on hygiene and nutrition.			
		10. Others (Specify)……..			
		2. Birth Preparedness Service			
			Actual provision		
		1. Counseling for Institutional delivery.			
		2. Explain cash assistance benefits for institutional delivery.			
		3. Identify transportation for delivery/emergency.			
		4. Identify a functional Govt. health centre or an accredited private health facility.			

		5. Identify Institution for referral / delivery			
		6. Explain about saving money for emergency / transportation / delivery.			
		7. Identify a birth companion			
		8. Identify blood donor			
		9. Explain about the risks and danger signs related to pregnancy and child birth.			
		10. Others (Specify)……..			
2.	Where do you advise a pregnant woman to go for delivery?		Normal (a)	Complicated (b)	
		1. Govt. District Hospital			
		2. Taluka Hospital			
		3.CHC			
		4. PHC			
		5. Private Hospital			
		6. Private Maternity Centre			
		7. Home			
		8. Others (Specify)……..			

3.	In general, how long would it take to reach this health facility?	1. 2. 3. 4.	< 30 minutes 30 – 60 minutes 61 – 120 minutes > 2 hours	
4.	What is the cost of transportation from home to facility?	1. 2. 3.	< Rs. 200/- Rs. 200 - 500 > Rs. 500	
5.	What are the transportation facilities available at your place?	1. 2. 3.	Ambulance Private car Taxi/ Bus	

		4. 5. 6. 7.	Cart Motorbike On foot Other (Specify)……..	
6.	How long does it take to arrange transportation for complicated cases?	1. 2. 3.	< 15 minutes 15-30 minutes > 30 minutes	
7.	How you rank the services in this facility?	1. 2. 3. 4.	Excellent Good Average Poor	
8.	Can you tell me why you have ranked the services as above?	1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	Doctor always there Facility always open Staff respond to my questions Facility always has necessary medicines/ blood Not a long wait Staff treat women with respect Often doctor not there Often facility is closed Staff do not answer my questions Facility does not have necessary medicines/ blood Long wait to be seen Staff treat women poorly Other (Specify)…….	
9.	How do you provide any of the following services?			
a.	Transportation service for women?			
b.	Way to get money to help families pay for transportation / birth			
c.	Ways to get blood/ blood donated during pregnancy or complication?			
d.	Ways to arrange for a birth companion?			

e.	Are any other services provided by you? If yes describe			
Support mechanisms and Barriers:				
13.	Do you feel rewarded in your role as ASHA?	1. 2.	Yes No	
14.	If yes what makes you feel rewarded about being ASHA?	1. 2. 3. 4. 5.	Recognition in community Ability to make difference in other women's lives Being able to help others Opportunity to learn new things Appreciation from superior Others (Specify)……..	
15.	What can be done to make you communicate more effectively with pregnant woman and her family?	1. 2. 3. 4. 5.	Provision of Flip book/chart/posters Support from ANM/AWW during home visit On job support for conducting counseling sessions at AWC / VHND Support for conducting group meetings / counseling sessions Others (Specify)……..	
16.	Whom do you first contact when you have difficulty in interacting with pregnant woman?	1. 2. 3. 4.	Anganwadi worker ANM Medical officer Others (Specify)……..	
17.	Who is more accessible to you?	1. 2. 3. 4.	Anganwadi worker ANM Medical officer Others (Specify)……..	
18.	Where you feel you need more support in helping pregnant woman of your community?			
19.	What are the challenges you face during planning for birth for a woman?			

Baby care – Knowledge

1.	After birth, someone should check the health of baby within first 6 weeks?	1. 2.	Yes No	
2.	When should first checkup take place?	1. 2. 3.	Hours…….. Days……. Weeks……	
3.	Where should first checkup take place?	1. 2.	Public Sector – Sub-centre, PHC, CHC, District hospital Private Sector – Pvt. Clinic, Hospital, Maternity/ Nursing Home	
4.	Breastfeeding should be done for babies?	1. 2.	Yes No	
5.	How long after birth should first breastfeed the baby?	1. 2.	Within one hour after birth More than one hour	
6.	The first liquid (colostrum) from breast should be given to the baby?	1. 2.	Yes No	
7	Anything other than breast milk should be given to the baby after birth?	1. 2.	Yes No	
8.	What should be given to the baby till 6 months after birth?	1. 2. 3. 4.	Exclusive Breastfeeding Gutti (Dry fruits paste in milk) Cow's or buffalo's milk Supplemental foods with breast milk	
9.	Do you know about burping?	1. 2.	Yes No	
10.	What is normal weight of the baby at birth?	1. 2. 3.	Less than 2 kg 2 kg 2.5 kg or more	
11.	When you call a baby very small or low birth weight?	1. 2. 3.	Less than 2.5 kg 2.5 kg More than 2.5 kg	
12.	When should first bath given to the baby?	1. 2.	Immediately after birth After 6 hours of birth	

13.	Do you know about Kangaroo Mother Care?	1. 2.	Yes No	
14.	When Kangaroo Mother Care is given?	1. 2. 3.	Low birth weight baby Normal weight baby Heavy weight baby	
15.	After birth, the baby can experience any serious health problems?	1. 2.	Yes No	
16.	If yes - What problems do the baby can experience?	1. 2. 3. 4. 5. 6. 7. 8. 9.	Difficult or fast breathing Yellow skin/eye colour (Jaundice) Poor sucking or feeding Pus, bleeding or discharge from around the umbilical cord Skin lesions or blisters Convulsions/spasm/rigidity Unconsciousness Red or swollen eyes with pus Others (Specify)……	
17.	Is it necessary to consult health care provider for these problems?	1. 2.	Yes No	
18.	If no – Why should not seek assistance for this problem?	1. 2. 3. 4. 5. 6. 7.	Facility too far No transport No childcare Too expensive Services are poor Did not know where to go Other (Specify)……..	
19.	If yes – In which health facility the baby should be taken for assistance?	1. 2.	Public Sector – Subcentre, PHC, CHC, District hospital Private Sector – Pvt. Clinic, Hospital, Maternity/ Nursing Home	
20.	Baby will get proper treatment for the problem in this facility?	1. 2.	Yes No	

1. **ASHAs Usability/Feasibility Assessment of BPCR Planner:** (adapted from SUS scale, https://www.usability.gov/how-to-and-tools/methods/system-usability-scale.html)

ASHAs Feasibility	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
I used BPCR planner frequently for all pregnant women under me.					
BPCR planner was complicated.					
I found the BPCR Planner easy to use.					
I think that I would need the support of a technical person to be able to use the birth planner.					
BPCR planner is a comprehensive birth planner.					
I felt inconsistency in implementing the BPCR planner.					
Peer counsellors can easily learn to use this BPCR Planner					
Using the BPCR planner proved to be challenging and inconvenient for me.					
Training on BPCR made it easy to use the BPCR planner among pregnant women under me.					
Apart from BPCR training I had to learn many other things to use BPCR planner.					

1. ASHAs Acceptability Assessment of BPCR Planner:

ASHAs Acceptability	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
I liked to use the BPCR planner.					
The BPCR planner was complex.					
The BPCR planner was easy to use among pregnant women.					
I felt requirement of a skilled person to use the BPCR planner					
The parts of the BPCR planner fit together well					
There was inconsistency in the BPCR planner					
I learned to use the BPCR planner quickly					
I found the BPCR planner cumbersome to use					
I felt confident using the BPCR planner					
Before I could utilize the BPCR planner effectively, I had to acquire new skills and knowledge.					

Interview Schedule for Mothers

'Feasibility and Acceptability study of Implementing Birth Preparedness and Complication Readiness Plan through ASHAs – A Health System Research'

Identification No. ----------

District ----------

Block/PHC/CHC ----------

Village ----------

Name of the sub centre ----------

Start Time…….. End Time…….....Date…..……

General Information of Mother

Q. No.	Question		Options	Code
1.	Name:			
2.	Age	1. 2. 3. 4. 5.	<18 years 18-20 years 20-29 years 30-39 years 40-49 years	
3.	Current Marital Status	1. 2. 3. 4.	Married Widowed Divorced Separated	
4.	Religion	1. 2. 3. 4.	Hindu Muslim Christian Others	
		1.	Illiterate	

5.	Highest level of Education	2. 3. 4. 5. 6.	Primary Secondary Undergraduate Graduate Post-graduate	
6.	Occupation of the participant	1. 2. 3. 4. 5. 6.	Home Maker Service Worker Skilled Worker Agricultural Worker Self Employed Elementary-Unskilled Labourer	
7.	Highest level of Education of Husband	1. 2. 3. 4. 5. 6.	Illiterate Primary Secondary Undergraduate Graduate Post-graduate	
8.	Occupation of the Husband	1. 2. 3. 4. 5.	Service Worker Skilled Worker Agricultural Worker Self Employed Elementary-Unskilled Labourer	
9.	Total family income per month			
10.	Family belongs to	1. 2.	BPL APL	
11.	House hold Structure	1. 2. 3.	Nuclear Joint Extended	
12.	Number of family members			
13.	Order of Pregnancy	1. 2.	First Second	

		3. 4. 5.	Third Fourth More than four	
14.	Number of living Children	1. 2.	Male…… Female……	
15.	Abortions	1. 2.	Yes No	
16.	Still births	1. 2.	Yes No	

Pregnancy Related – Knowledge

1.	Can unforeseen problems related to pregnancy occur during any pregnancy or childbirth that could endanger the life of a woman?	1. 2. 3.	Yes No Don't know	
2.	What are some serious health problems that can occur during pregnancy that could endanger the life of a pregnant woman?	**Key Danger signs** 1. Severe bleeding 2. Swollen hands/ face 3. Blurred vision 4. High BP	**Other Danger signs** 1.Convulsions 2. Severe headache 3. High fever 4. Loss of consciousness 5. Difficulty breathing 6. Severe weakness 7. Severe abdominal pain 8. Accelerated/ reduced fetal movements 9. Water breaks without labor 10. Other (Specify)……	
3.	In your opinion could a woman die from any of above-mentioned problems?	1. 2. 3.	Yes No Don't know	

4. What are the Components of Antenatal Care (ANC)?				
	Options	**Components of ANC**		
1.	Early registration			
2.	Regular weight check			
3.	Blood test for Anaemia			
4.	Blood test for HIV/AIDS			
5.	Urine test for protein and sugar			
6.	Measuring blood pressure (BP)			
7.	IFA tablets for 3 months			
8.	Two doses of TT injection			
9.	Nutrition education			
10.	Hygiene education			
11.	Birth preparedness			
12.	Complication Readiness			
6. What information did you get from ASHA when she visits you and your family?				
1.	All the pregnant women are at risk of developing pregnancy related complications.			
2.	Maternal complications are unpredictable but are treatable.			
3.	Importance and Components of ANC visits.			
4.	Signs and symptoms of complications during pregnancy, child birth and postpartum period.			
5.	Birth preparedness plans Eg; Nearby health facility to deliver, birth companion, saving money for delivery/complications, identification of transport, contingency plans in the event of complications etc.			
6.	Family planning (Contraceptive) methods.			
6.	Other (Specify)……			
7.	When should a pregnant woman register for Antenatal Checkup (ANC)?	1. 2. 3.	1st trimester 2nd trimester 3rd trimester	
8.	How many Antenatal Checkups (ANC) should a pregnant woman have?	1. 2. 3.	Three Four > Four	

Labor and Childbirth – Knowledge

1.	What are some serious health problems that can occur during Labor and Childbirth?	**Key Danger Signs** 1.Severe vaginal bleeding 2. Prolonged labor (>12 hours) 3. Convulsions 4. Retained placenta beyond 30 minutes	**Other Danger Signs** 1.Severe headache 2. High fever 3. Loss of consciousness 4. High BP 5. Other (Specify)…….	
2.	In your opinion could a women die from any of the above mentioned problems?	1. 2. 3.	Yes No Don't know	
3.	What are some things a woman can do to prepare for birth?	1. Identify health facility 2. Identify skilled provider 3. Identify mode of transportation 4. Save money for delivery/complications 5. Identify birth companion 6. Identify blood donor 7. Prepare clean items for birth 8. Others (Specify)……		

Postpartum Care – Knowledge

1.	What are some serious health problems that can occur during the first 2 days after birth that could endanger the life of the woman?	**Key Danger Signs** 1. Severe vaginal bleeding 2. Malodorous vaginal discharge 3. High fever 4. High BP	**Other Danger Signs** 1.Convulsions 2. Severe headache 3. Blurred vision 4. Loss of consciousness 5. Difficulty breathing 6. Severe weakness 7. Swollen hands/ face 8. Other (Specify)……	

2.	In your opinion could a woman die from any of the above mentioned problems?	1. 2. 3.	Yes No Don't know	
3.	Could you name some types of basic care that can be provided to a newborn baby immediately after birth?	1. 2. 3. 4. 5.	Early breastfeeding (within 1 hour) Exclusive breastfeeding Dry and wrap Cord care Other (Specify)……	
4.	How many times should a mother have postpartum checkup after childbirth?	1. 2. 3. 4. 5.	Once at 3 weeks Once at 6 weeks 3 times: at 6 hours, 6 days and 6 weeks Only if she has danger sign Other (Specify)…….	
5.	During postpartum visit what is advised by ASHA?	1. 2. 3. 4. 5.	Rest for at least 6 weeks Eat more nutritious food Exclusive breastfeeding for 6 months Need for contraception methods Others (Specify)……..	

Pregnancy Related – Practice

1.	Did you see anyone for Antenatal Checkup (ANC)?	1. 2.	Yes No	
2.	When did you register for Antenatal Checkup (ANC)?	1. 2. 3.	1st trimester 2nd trimester 3rd trimester	
3.	How many Antenatal Checkups (ANC) did you have?	1. 2. 3. 4.	Two Three Four > Four	

4.	**What were the Components of your Antenatal Care (ANC)?**			
1.	Regular weight check			
2.	Blood test for Anaemia			
3.	Urine test for protein and sugar			
4.	Blood test for HIV/AIDS			
5.	Measurement of blood pressure (BP)			
6.	IFA tablets for 3 months			
7.	Doses of TT injection – 1 or 2			
8.	Education on nutrition, rest and hygiene			
9.	Birth preparedness			
10.	Complication Readiness			
5.	**During this pregnancy did ASHA advise you about any of the following at least once?**			
1.	Danger signs of serious health problems during pregnancy, childbirth or soon after birth	Yes - 1	No - 2	
2.	Where to go in case of serious health problems?			
3.	Where you should give birth?			
4.	Arrangements for transportation?			
5.	Arrangements for money?			
6.	Arrangements for birth companion?			
7.	Arrangements for blood donor?			
8.	Arrangements for skilled provider for birth?			
9.	About family planning methods?			
6.	**What preparations did you do for your last birth?**			
1.	Identified health facility for birth/ emergency	Yes - 1	No - 2	
2.	Identified skilled provider			
3.	Identified mode of transportation			
4.	Saved money for delivery/complications			
5.	Identified birth companion			
6.	Identified blood donor			
7.	Prepared clean items for birth			
8.	Others (Specify)……			
7.	Did you experience any problem during your last pregnancy?	Yes - 1	No - 2	

8.	Did you experience any serious health problems during pregnancy that could endanger the life?	**Key Danger signs** 1. Severe bleeding 2. Swollen hands/face 3. Blurred vision 4. High BP	**Other Danger signs** 1.Convulsions 2. Severe headache 3. High fever 4. Loss of consciousness 5. Difficulty breathing 6. Severe weakness 7. Severe abdominal pain 8. Accelerated/ reduced fetal movements 9. Water breaks without labor 10. Other (Specify)…	
9.	Did you seek assistance for this problem?		Yes – 1 / No – 2	
10.	If no – why you did not seek assistance for this problem?	1. Facility too far 2. No transport 3. No childcare 4. Too expensive 5. Services are poor 6. Did not know where to go 7. Other (Specify)……..		
11.	If yes – which health facility did you go for assistance?	1. Public Sector – Subcentre, PHC, CHC, District hospital 2. Private Sector – Clinic, Hospital, Maternity/ Nursing Home		
12.	Who made the final decision about your pregnancy and health related problems?	1. Respondent 2. Husband 3. Respondent's parents 4. Respondent's in-laws 5. ASHA/AWW 6. Friends/neighbour 7. Other (Specify)…….		

Labor and Childbirth – Practice

1.	Where did you give birth to your last child?	1. 2. 3.	Home Public Sector – Subcentre, PHC, CHC, District hospital Private Sector – Pvt. Clinic, Hospital, Maternity/ Nursing Home	
2.	Did you plan to give birth at this place?	1. 2.	Yes No	
3.	Who conducted delivery?	1. 2. 3.	Doctor Nurse Trained Birth Attendant	
4.	Who made the final decision about where you would give birth?	1. 2. 3. 4. 5. 6. 7.	Respondent Husband Respondent's parents Respondent's in-laws ASHA/AWW Friends/neighbour Other (Specify)…….	
5.	How did you go to the Health facility?	1. 2. 3. 4. 5. 6. 7.	Ambulance Private car Taxi/ Bus Cart Motorbike On foot Other (Specify)……..	
6.	Who accompanied you to the place where you gave birth (birth companion)?	1. 2. 3. 4. 5. 6. 7. 8.	No one ASHA AWW (Anganwadi worker) Husband Respondent's parents Respondent's in-laws Friend/ Neighbor Other (Specify)…….	

7.	How long did it take to reach the health facility?	1. 2. 3. 4.	< 30 minutes 30 – 60 minutes 61 – 120 minutes > 2 hours	
8.	What is the total cost of transportation from home to facility?	1. 2. 3.	< Rs. 200/- Rs. 200 - 500 > Rs. 500	
9.	How long after reaching the health facility did it take for you to get services from the health personnel?	1. 2. 3. 4.	< 30 minutes 30 – 60 minutes 61 – 120 minutes > 2 hours	
10.	In your opinion how are the services in this facility?	1. 2. 3. 4.	Excellent Good Average Poor	
11.	Can you tell me why you have ranked the services as above?	1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	Doctor always there Facility always open Staff respond to my questions Facility always has necessary medicines/ blood Not a long wait Staff treat women with respect Often doctor not there Often facility is closed Staff do not answer my questions Facility does not have necessary medicines/ blood Long wait to be seen Staff treat women poorly Other (Specify)…….	
12.	Was the child born by Cesarean Section?	1. 2.	Yes No	
13.	Was the child born by forceps or Vacuum Extractor?	1. 2.	Yes No	

14.	During labor and birth did you experience any serious health problems related to birth?	1. 2.	Yes No	
15.	If yes - What problems did you experience?	1. 2. 3. 4. 5. 6. 7. 8.	Severe bleeding Severe headache Convulsions High fever Loss of consciousness Prolonged labor (>12 hours) Retained placenta beyond 30 minutes Other (Specify)……	
16.	Did you take assistance for these problems?	1. 2.	Yes No	

Postpartum Care – Practice

1.	Did you go for health checkup after your childbirth?	1. 2.	Yes No	
2.	If yes - How many times did you go for health checkup?	1. 2. 3. 4.	Once 2 times 3 times >3 times	
3.	How did you take care of yourself and your baby after childbirth?	1. 2. 3. 4. 5. 6.	Kept the baby warm Rested for 6 weeks Ate more nutritious food Started breastfeeding within 1 hour Exclusive breastfeeding Adopted contraception method	
4.	During 2 days after the birth of your child, did you experience any serious health problems related to birth?	1. 2.	Yes No	
5.	If yes - What problems did you experience?	1. 2. 3.	Severe bleeding Severe headache Blurred vision	

		4. 5. 6. 7. 8. 9. 10. 11.	Swollen hands/face Convulsions High fever Loss of consciousness Malodorous vaginal discharge Difficulty breathing Severe weakness Other (Specify)……	
6.	Did you seek assistance for this problem?	1. 2.	Yes No	
7.	If no - Why did you not seek assistance for this problem?	1. 2. 3. 4. 5. 6. 7.	Facility too far No transport No childcare Too expensive Services are poor Did not know where to go Other (Specify)……..	
8.	Who made the final decision about whether you should seek assistance or no?	1. 2. 3. 4. 5. 6. 7.	Respondent Husband Respondent's parents Respondent's in-laws Friend/ Neighbor ASHA/AWW Other (Specify)…….	
9.	Which health facility did you go for assistance?	1. 2.	Public Sector – Subcentre, PHC, CHC, District hospital Private Sector – Pvt. Clinic, Hospital, Maternity/ Nursing Home	
10.	Did you get proper treatment in the health facility?	1. 2.	Yes No	

Baby care – Practice

1.	After you gave birth, did someone check the health of your baby within the first 6 weeks after birth?	1. 2.	Yes No	
2.	When did first checkup take place?	1. 2. 3.	Hours…….. Days……. Weeks……	
3.	Where did first checkup take place?	1. 2.	Public Sector – Subcentre, PHC, CHC, District hospital Private Sector – Pvt. Clinic, Hospital, Maternity/ Nursing Home	
4.	Did you ever breastfeed your baby?	1. 2.	Yes No	
5.	How long after birth did you first breastfeed your baby?	1. 2.	Within one hour after birth More than one hour	
6.	Did you give the baby the first liquid (colostrum) that came from your breasts?	1. 2.	Yes No	
7.	Your baby was very small (LBW) or normal weight baby?	1. 2.	Very small baby (LBW) Normal weight baby	
8.	When did you give first bath to the baby?	1. 2.	Immediately after birth After 6 hours of birth	
9.	During 7 days after birth, your baby experienced any serious health problems?	1. 2.	Yes No	
10.	If yes - What problems did the baby experience?	1. 2. 3. 4. 5. 6.	Difficult or fast breathing Yellow skin/eye colour (Jaundice) Poor sucking or feeding Pus, bleeding or discharge from around the umbilical cord Skin lesions or blisters Convulsions/spasm/rigidity	

		7. 8. 9.	Unconsciousness Red or swollen eyes with pus Others (Specify)……	
11.	Did you seek assistance for this problem?	1. 2.	Yes No	
12.	If no – Why did you not seek assistance for this problem?	1. 2. 3. 4. 5. 6. 7.	Facility too far No transport No childcare Too expensive Services are poor Did not know where to go Other (Specify)……..	
13.	If yes – In which health facility the baby was taken for assistance?	1. 2.	Public Sector – Subcentre, PHC, CHC, District hospital Private Sector – Pvt. Clinic, Hospital, Maternity/ Nursing Home	
14.	Did the baby get proper treatment for the problem in this facility?	1. 2.	Yes No	
15.	Who made the final decision whether to take baby to the health facility or no?	1. 2. 3. 4. 5. 6. 7.	Respondent Husband Respondent's parents Respondent's in-laws Friend/ Neighbor ASHA/AWW Other (Specify)…….	

ANNEXURE IV – PHOTOGRAPHS

Training of ASHAs on BPCR

Data Collection from ASHAs


Indian Doctor
Sir, Ronald Ross

Data Collection from Mothers

ANNEXURE V – PAPER PRESENTATIONS

1. Paper presented on – **'Assessment of knowledge & practice of Birth Preparedness and Complication Readiness among ASHAs'** at National Seminar on " The UN Sustainable Development Goals, Ba-Bapu and Civil Society" on 31st May 2019, held at Karnataka State Rural Development and Panchayat Raj University (KSRDPRU) Gadag, Karnataka

2. Paper presented on – **'A Cross Sectional Study to Assess the Association between Knowledge of Intranatal & Postnatal Care Services and Sociodemographic Profile of ASHAs'** at 5th Amrita International Public Health Conference on 2nd December 2022 held at Amrita Institute of Medical Sciences, Kochi, Kerala, India

   I received **"Promising Scientific Paper Award"** for this oral paper presentation.

3. Paper presented on – **'Assessing the Feasibility and Acceptance of Executing Birth Preparedness and Complication Readiness Strategies via ASHA Workers: A Before & After Study'** at 6th Amrita International Public Health Conference on 2nd December 2023 held at Amrita Institute of Medical Sciences, Kochi, Kerala, India

I received **"Promising Paper Award"** for this oral paper presentation.

ANNEXURE VI – PUBLICATIONS

1. **Kari A**, Angolkar M. **Assessment of knowledge & practice of Birth Preparedness and Complication Readiness among ASHAs–A pilot study**. Clinical Epidemiology and Global Health. 2021 Jan 1;9:175-8

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Original article

Assessment of knowledge & practice of Birth Preparedness and Complication Readiness among ASHAs – A pilot study

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ARTICLE INFO

Keywords:
Maternal health
Birth preparedness
Complication readiness
Accredited social health activists

ABSTRACT

Background: Maternal mortality is a substantial burden in developing countries. Birth Preparedness and Complication Readiness (BPRC) is an intervention included by WHO as an essential element of the antenatal care package. It is based on the premise that preparing for birth and being ready for complications reduces all three phases of delays in – identifying complications and deciding to seek care, identifying and reaching a health facility and receiving adequate and appropriate treatment at the health facility.

Objective: To assess the knowledge and practice of Birth Preparedness and Complication Readiness among ASHAs.

Method: ology: A pilot study was conducted on ASHAs of Mutaga Primary Health Centre (PHC), Belagavi Rural Area. All (28) ASHAs were included in the study. Informed consent was obtained after explaining about the study. Data regarding Knowledge and Practice towards Birth Preparedness and Complication Readiness (BPRC) was collected using a standard, pre-designed questionnaire by JHPIEGO.

Results: The findings of the study revealed that 71.42%, 96.42% and 92.85% of ASHAs were knowing about severe bleeding which is one of the key danger signs during pregnancy, labour and postpartum period respectively. Knowledge of ASHAs regarding swollen hands/face which is another key danger sign was around 42.85%. About 32.14% of ASHAs were knowing about blurred vision during pregnancy. Less than 50% of the ASHAs were having knowledge about other danger signs. ASHAs had good knowledge about components of Antenatal care (ANC) but less than 25% of ASHAs were knowing BPCR as a component of ANC.

Conclusion: Knowledge of ASHAs about the components and practice of BPCR was poor. Hence need of the hour is to train ASHAs regarding components of BPCR.

1. Introduction

Maternal mortality plagues much of the world. In 2015 there were 303,000 maternal deaths which represented a global maternal mortality ratio (MMR) of 216/1,00,000 live births.[1] India has progressed from 556 maternal deaths per 1,00,000 live births in 1990 to 130 per 1,00,000 live births in 2016. According to Sustainable Development Goal (SDG) India should achieve a target of an MMR below 70 by 2030.[2]

Complications like abortion, preeclampsia, eclampsia, ruptured uterus, puerperal sepsis, postpartum haemorrhage etc which result in maternal mortality, morbidity and perinatal death are unpredictable. Their onset may be sudden and severe.[3] Major barrier for reducing maternal morbidity and mortality is a delay in responding to the onset of complications and onset of labor by pregnant women, her family and health care providers.[4]

Every pregnant woman during all the 3 trimesters, during labor & postpartum period is at the risk of facing sudden, unpredictable complications that could end in death or injury to herself or to her infant. Complications related to pregnancy and childbirth cannot be predicted reliably. Hence, to overcome such complications it's necessary to employ some strategies.[5]

Birth Preparedness and Complication Readiness (BPCR) is an intervention introduced by WHO to plan for births and deal with emergencies during pregnancy, labor and postpartum period. BPCR addresses 3 delays and helps pregnant women, their families and communities to take effective actions. BPCR is a key component in safe motherhood programs which are globally accepted. It helps pregnant women to identify the complications, reach the health facility in time and seek proper professional care in time by reducing morbidities and mortalities due to complications because of 3 delays. BPCR include ANC components like early registration of pregnancy, knowledge of danger

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signs during pregnancy, labor and postpartum period, early identification of health facility for giving birth and emergency, identification of skilled birth attendant, identification of transportation, identification of birth companion, saving enough money for delivery, emergency and transportation, identification of a compatible blood donor if any emergency arises.[6]

BPRC is a programme approach to effectively utilize the maternal and new-born health services. It is based on the strategy that thoroughly knowing the complications, being prepared to face complications and proper planning for birth reduces three delays in - identifying complications and deciding to seek care, identifying and reaching a health facility and receiving adequate and appropriate treatment at the health facility. The components of BPCR are included as a part of new World Health Organization antenatal care model in clinical setting.[7] BPCR makes effective use of community health workers and health promotion groups in addition to formal health services. A 2010 systematic review and meta-analysis of community-based intervention packages found a significant reduction in neonatal mortality (twelve studies, risk ratio 0.76, 95% CI 0.68, 0.84), but inconclusive evidence of reduction in maternal mortality (ten studies, risk ratio 0.77; 0.59, 1.02).[8] Community mobilization through stakeholders such community health workers, or through participation in women's groups also forms part of the BPCR concept.[9]

In India, with the introduction of Accredited Social Health Activist (ASHA) workers under the National Rural Health Mission (NRHM) from 2005, utilization of healthcare services at the peripheral level has improved.[10] ASHA is a female volunteer selected by the community, deployed in her own village (one in every 1000 population) after a short training on community health.[11]

WHO has strongly recommended for further BPCR interventions and research. Studies on BPCR are very limited in India and nonexistent in the study area. Hence the current research is aimed to address gaps in understanding of BPCR. The objective of the current pilot study is to assess the knowledge and practice of Birth Preparedness and Complication Readiness among ASHAs.

2. Materials and methods

The present pilot study was undertaken to assess the knowledge and practice of Birth Preparedness and Complication Readiness among ASHAs.

A cross sectional study was conducted in Mutaga Primary Health Centre (PHC), Rural Belagavi, Karnataka, India. The study period was from January 2019 to May 2019. The study was conducted on Accredited Social Health Activists (ASHAs) working under Mutaga Primary Health Centre (PHC). Complete list of all ASHAs were included in the study. Complete enumeration sampling technique was used. All ASHAs had completed 6 months in their job and all ASHAs gave consent for study.

A predesigned and structured questionnaire from ***JHPIEGO*** (Johns Hopkins Program for International Education in Gynecology and Obstetrics) was used for data collection. Permission to collect data from ASHAs was obtained from concerned authority. Informed consent was obtained from all the participants after providing detailed information on objectives of the study, risks and benefits involved and voluntary nature of participation. Data collectors were from Masters in Public Health (MPH) background and were trained thoroughly prior to data collection. Data regarding knowledge and practice towards Birth Preparedness and Complication Readiness (BPRC) was collected using questionnaire by JHPIEGO. The data collectors interviewed the individual participant (ASHA) and collected the required data using questionnaire. Confidentiality of the study participants was maintained throughout the study. Data was entered by the researcher and was analyzed by the Biostatistician to maintain the accuracy and appropriateness. Frequency and percentage were used to analyze the data for descriptive statistics. SPSS version 22 was used to analyze the data.

Table 1
Distribution of participants according to sociodemographic data.

1. Distribution according to Age		
Age in years	No. of participants	Percentage (%)
> 30	6	21.42
30–39	17	60.71
40–49	5	17.85
2. Distribution according to Marital Status		
Single	3	10.71
Married	22	78.57
Widowed	3	10.71
3. Distribution according to Religion		
Hindu	24	85.71
Others	4	14.28

3. Results

Table 1 shows that 60% of the participants were in the age group of 30–39 years. Majority of the participants were married. Majority of the Participants were Hindus.

Table 2 shows that majority (71.42%) of ASHAs had knowledge regarding severe bleeding and less than half of the ASHAs were aware about swollen hands/face. Only 32.14% of ASHAs knew about blurred vision as a key danger sign.

Table 3 shows that less than 50% of the ASHAs were having knowledge about other danger signs like, severe headache, high fever, loss of consciousness, difficulty in breathing, severe abdominal pain, accelerated or reduced fetal movements and water breaks without labor. About 42.85% ASHAs had known about convulsions. Majority (67.85%) of the ASHAs had knowledge about severe weakness as danger sign.

Table 4 shows that majority of the ASHAs (85%) helped pregnant women in ANC registration, 4 ANC check-ups (71%), 2 TT injections (78%), provided IFA tablets (75%). More than 60% of ASHAs counseled pregnant women for institutional delivery, cash assistance and transportation. Around 60.71% of ASHAs advised pregnant women on hygiene and nutrition. Less than 50% of ASHAs escorted pregnant women to village health day. About 57.14% of ASHAs got nutrition supplements from anganwadi centers. About 60.71% of ASHAs gave home visits and 57.14% of ASHAs calculated date of delivery.

Table 5 shows that 71.42% ASHAs did counselling for institutional delivery, 60.71% ASHAs explained cash assistance benefits for institutional delivery, 67.85% ASHAs identified transportation for delivery/emergency and 67.85% ASHAs identified institution for referral/delivery. Less than 50% of the ASHAs counseled pregnant women regarding identification of functional Govt. health centre, referral services, saving money, identify birth companion, blood donor, explained about risks & danger signs related to pregnancy & child birth.

ASHAs had good knowledge about components of Antenatal care (ANC) but less than 25% of ASHAs were knowing BPCR as a component of ANC. Less than 35% of ASHAs had knowledge about postpartum check-up.

Table 2
Distribution of Participants according to Knowledge of Key-danger signs during pregnancy.

Key-danger signs	No. of participants	Percentage (%)
Severe Bleeding	20	71.42
Swollen hands/face	12	42.85
Blurred Vision	9	32.14

Table 3
Distribution of Participants according to Knowledge of other danger signs during pregnancy.

Other danger signs	No. of participants	Percentage (%)
Convulsions	12	42.85
Severe headache	6	21.42
High fever	2	7.14
Loss of consciousness	8	28.57
Difficulty in breathing	8	28.57
Severe weakness	19	67.85
Severe abdominal pain	8	28.57
Accelerated or reduced fetal movements	5	17.85
Water breaks without labor	6	21.42

Table 4
Distribution of participants according to antenatal care (ANC) service provision.

ANC Service Provision	No. of participants	Percentage
Helping in registration for ANC services/JSY scheme	24	85.71
Calculating date of delivery	16	57.14
Providing home visits	17	60.71
Helping with at least 4 ANC check-ups	20	71.42
Facilitating TT injection	22	78.57
Providing iron/folate (IFA) tablets	21	75
Escorting them to village health day	13	46.4
Get nutrition supplements from anganwadi centre	16	57.14
Advising them on hygiene and nutrition	17	60.71

Table 5
Distribution of participants according to birth preparedness service provision.

BPCR Service Provision	No. of participants	Percentage
Counselling for institutional delivery	20	71.42
Explain cash assistance benefits for institutional delivery	17	60.71
Identify transportation for delivery/emergency	19	67.85
Identify a functional govt. health centre or an accredited private health facility	15	53.57
Identify institution for referral/delivery	10	35.71
Explain about saving money for emergency/ transportation/delivery	11	39.28
Identify a birth companion	9	32.14
Identify blood donor	12	42.85
Explain about the risks and danger signs related to pregnancy and child birth	11	39.28

4. Discussion

This research was conducted with an objective to assess the knowledge and practice of Birth Preparedness & Complication Readiness (BPCR) among Accredited Social Health Activists (ASHAs). In India, with the introduction of Accredited Social Health Activist (ASHA) workers under the National Rural Health Mission (NRHM) from 2005, utilization of healthcare services at the peripheral level has improved.[10] ASHA is a female volunteer selected by the community, deployed in her own village (one in every 1000 population) after a short training on community health.[11]

Studies on BPCR are very limited in India and nonexistent in the study area. BPCR is a very important component in ANC care but most of the ASHA workers are having very less knowledge and practice of BPCR. Skill based training is not provided to ASHA workers which is a hindrance for their knowledge and practice. Incentive provided for them is also negligible compared to their workload. There are many gaps in understanding of BPCR by health care workers and provision of essential services towards BPCR. Hence the current research is aimed to address gaps in understanding of BPCR.

The results of the present study showed that majority of the ASHA workers were middle aged and married. A study by Kochukuttan S et al. showed that mean age of ASHAs was 30–35 years, 90% were married. There was less than 25% of the performance towards obstetric danger sign assessment.[12] Findings from a study conducted in Delhi also showed that majority of the participants were from the age group of 25–45 years of age group and were married.[15]

A study from Rohtak, India showed that knowledge of danger signs and birth preparedness services provided by ASHAs were poor. Similarly in present study also knowledge of danger signs and birth preparedness services provided by ASHAs were poor.[13] A study from Aligarh showed that 88% ASHAs had knowledge about excessive vaginal bleeding. Similarly in present study also more than 70% of the ASHAs were aware about excessive bleeding as complication.[14]

A study from Delhi, India revealed that ASHAs knowledge was good but their practices were poor. Present study results were contrast as knowledge and practice both were poor.[15] Findings from a study conducted in Udupi, Karnataka revealed that overall knowledge of ASHA workers was sufficient in the field of MCH but practices were poor. In present study only the knowledge regarding vaginal bleeding was good but other knowledge and practices were poor.[16]

Strengths of the present study: The study was carried out in an appropriate manner following all the necessary steps. This study was carried out to customize the questionnaire and validate it.

Limitation of the present study: As the current study is a pilot study only one PHC was included and limited number of participants were interviewed.

This study was an initiation to carry out a larger study which will be conducted by the researcher in near future.

5. Conclusion

ASHAs are the most important activists/key workers in maintaining the health of pregnant women in the society especially in rural areas where health facilities are scarce. More than 70% of ASHAs were aware of severe bleeding as key danger sign, more than 50% were aware about severe weakness but their knowledge regarding other key danger signs like - swollen hands/face, blurred vision, convulsions, high fever, severe headache was negligible. Knowledge & practice of components of BPCR were also very poor. Hence need of the hour is to train ASHAs regarding components of Birth Preparedness & Complication Readiness (BPCR).

Ethical approval

Not applicable.

Consent to participate

Obtained.

Consent for publication

Not applicable.

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Declaration of competing interest

The authors declare that they have no conflict of interest.

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2. **Kari A,** Angolkar M. **Intranatal (labor & child birth) and postnatal care services–Role of ASHAs**. Clinical Epidemiology and Global Health. 2021 Oct 1;12:100915

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Intranatal (labor & child birth) and postnatal care services – Role of ASHAs

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Keywords:
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ABSTRACT

Background: Maternal mortality and neonatal mortality are substantial burden in developing countries. Every pregnant woman during all the 3 trimesters, during labor & postpartum period is at the risk of facing sudden, unpredictable complications that could end in death or injury to herself or to her infant. Complications like abortion, preeclampsia, eclampsia, ruptured uterus, puerperal sepsis, postpartum haemorrhage etc. which result in maternal mortality, morbidity and perinatal death are unpredictable.
Objective: To assess the knowledge of ASHAs regarding intranatal and postnatal care services.
Methodology: A cross sectional study was conducted on ASHAs of 2 PHCs and 1 CHC of Belagavi Rural area. All (100) ASHAs were included in the study. Ethical clearance and Informed consent was obtained. Data regarding the knowledge of ASHAs about their roles and responsibilities towards intranatal and postnatal care services was collected using questionnaire by JHPIEGO.
Results: The findings of the study revealed that ASHAs had knowledge about high BP 75%, 64%, severe vaginal bleeding 82%, 95%, convulsions (43%) during Labor and Childbirth and during postpartum period respectively. They had very low knowledge regarding - prolonged labor (12%), retained placenta (7%). Early breastfeeding (93%), dry and wrap (100%) and exclusive breastfeeding (80%) were 3 basic cares provided to the baby. There was a significant linear association between knowledge and level of education of ASHAs (p-value - 0.0092).
Conclusion: Knowledge of ASHAs about intranatal and postnatal care services was poor. Hence need of the hour is to train ASHAs regarding intranatal and postnatal care services.

1. Introduction

Maternal Mortality is a rampant problem of developing and less developed countries. Global maternal mortality ratio (MMR) of 216/1,00,000 live births was seen in 2015 which resulted in a total of 3,03,000 maternal deaths. India has progressed from 556 maternal deaths per 1,00,000 live births in 1990 to 130/1,00,000 live births in 2016. India should achieve a target of an MMR below 70 by 2030 according to Sustainable Development Goals (SDG).[1] The current (year 2021) infant mortality rate (IMR) in India is 29/1000 live births which has been declined 3.61% from the year 2020.[3]

Every pregnant woman during pregnancy, labor & postpartum period is at the risk of facing sudden, unpredictable complications that could end in death or injury to herself or to her infant. Complications like abortion, preeclampsia, eclampsia, ruptured uterus, puerperal sepsis, postpartum haemorrhage etc. which result in maternal mortality, morbidity and perinatal death are unpredictable.[3] Major barrier for reducing maternal morbidity and mortality is a delay in responding to the onset of complications and onset of labor.[1] Most of maternal deaths are in low-resource settings, rural areas and poor communities. The presence of a skilled attendant at birth (SBA) is the key strategy to prevent the leading causes of maternal and neonatal mortality and morbidity.[5] Preparing for birth and being ready for complications reduces all three phases of delays in – identifying the complication and deciding to seek care, identifying and reaching a health facility and receiving adequate and appropriate treatment at the health facility.[6]

Government of India launched the National Rural Health Mission on 5th April 2005. Accredited Social Health Activist (ASHA), a new band of community based grass root level health workers was proposed to escort and transport the client to reach the hospital and provide referral services in case of complications. A time to time assessment of the knowledge of ASHAs is essential as the success of government's health programmes in rural areas depends on them.[2,4] ASHAs also act as health activists in the community who will create awareness on health and its determinants, counsel mothers on key healthy behaviours and mobilize the community towards local health planning and increased utilization

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and accountability of the existing health services.[4]

There is scarcity of studies on ASHAs regarding their role in intranatal and postnatal care service provision at study area. Hence this study has been conducted to - assess the knowledge of ASHAs regarding intranatal (labor & child birth) and postnatal care services and to estimate the association between knowledge of intranatal and postnatal care services and sociodemographic profile of ASHAs.

2. Materials and method

2.1. Study design: cross sectional study

Source of Data: Rural area of Belagavi Taluka consists of 11 Primary Health Care Centres (PHCs) and one Community Health Care Centre (CHC). Two PHCs were selected by simple random sampling and a CHC was included in the study. .

Study Period: May 2019 to December 2020.

Study population: All ASHAs from three selected clusters were included in the study. Complete enumeration sampling technique was used. All ASHAs had completed 6 months in their job and they gave consent for study.

Inclusion Criteria: 1. ASHA workers who had an experience of more than 6 months.

2. AHSA workers who gave the consent

Exclusion Criteria: Newly joined ASHA workers with less than 6 months of experience.

Data Collection Tool: A predesigned and structured questionnaire from ***JHPIEGO*** (Johns Hopkins Program for International Education in Gynecology and Obstetrics) was used for data collection. Questionnaire was validated and customized through pilot study.

Ethical Considerations: Ethical approval was obtained from Ethical Committee (Human) for Ph.D Research, KAHER, Belagavi. Permission to collect data from ASHAs was obtained from Department of Health and Family Welfare Services (RCH). Informed consent was obtained from all the participants after providing detailed information.

Data Collection Procedure: Data collectors were from Masters in Public Health (MPH) background and were trained thoroughly prior to data collection. Data regarding the knowledge of ASHAs about their roles and responsibilities towards intranatal and postnatal care services was collected through individual interview using questionnaire by JHPIEGO. Confidentiality of the study participants was maintained throughout the study.

Statistical Analysis of Data: Data was entered by the researcher and was analyzed by the Biostatistician to maintain the accuracy and appropriateness. Descriptive analysis of the data is done using R i386 3.6.3. Continuous variables are represented by mean ± standard deviation form. Categorical variables are represented by frequency tables. Categorical variables are compared using chi-square test, p-value<0.05 considered as significant.

3. Results

Table 1: Most of the subjects were of the age group 30–39 years. Majority of the subjects (86%) were married. About 98% of the subjects were Hindus. Around 69% of the subjects had secondary level of education. Majority of the subjects (97%) belonged to BPL family. Around 78% of the subjects had more than 3 years of working experience.

Table 2: As per ASHA workers, high BP (75%), severe vaginal bleeding (82%), convulsions (43%) can occur during Labor and Childbirth. They had very low knowledge regarding - prolonged labor (12%), retained placenta (7%), severe headache, high fever etc. Prepare clean items for birth (94%), save money for delivery & complication (82%) and mode of transportation (74%) were 3 common things a woman to prepare for the birth. Only 3% of them knew about identifying the blood donor and 6% knew about identifying skilled provider.

Table 3: Majority of ASHAs knew about severe vaginal bleeding (95%) and high BP (64%) during the first 2 days after birth. Early breastfeeding (93%), dry and wrap (100%) and exclusive breastfeeding (80%) were 3 common basic cares provided to the baby. They advised

Table 1
Distribution of Subjects according to their Sociodemographic Data.

Factors	Sub-category	Count
Age group	<30 years	9 (9%)
	30–39 years	64 (64%)
	40–49 years	24 (24%)
	≥50 years	3 (3%)
Current Marital status	Single	1 (1%)
	Married	86 (86%)
	Widowed	11 (11%)
	Divorced	0 (0%)
	Separated	2 (2%)
Religion	Hindu	98 (98%)
	Muslim	2 (2%)
	Christian	0 (0%)
	Others	0 (0%)
Level of education	Primary	18 (18%)
	Secondary	69 (69%)
	Undergraduate	12 (12%)
	Graduate	1 (1%)
	Post-graduate	0 (0%)
Level of education of Husband	NR	13 (13%)
	Primary	23 (23%)
	Secondary	44 (44%)
	Undergraduate	16 (16%)
	Graduate	4 (4%)
	Post-graduate	0 (0%)
Income of the family		8995 ± 4352.22
Family belongs to	BPL	97 (97%)
	APL	3 (3%)
Household structure	Nuclear	53 (53%)
	Joint	47 (47%)
	Extended	0 (0%)
Work experience of ASHAs	6–12 months	9 (9%)
	13–24 months	7 (7%)
	25–36 months	6 (6%)
	>36 months	78 (78%)
Rounds of training	1 round	5 (5%)
	2 rounds	5 (5%)
	3–4 rounds	35 (35%)
	>4 rounds	55 (55%)
Any training in last 3 months		39 (39%)

Table 2
Distribution of subjects by labor and childbirth – knowledge.

What are some serious health problems that can occur during Labor and Childbirth?		
Key Danger signs	Severe vaginal bleeding	82%
	Prolonged labor (>12 h)	12%
	Convulsions	43%
	Retained placenta beyond 30 min	7%
Other Danger signs	Severe headache	5%
	High fever	5%
	Loss of consciousness	16%
	High BP	75%
	Excessive water leakage	6%
In your opinion could a woman die from any of the above-mentioned problems?*		84%
What are some things a woman can do to prepare for birth?	Identify health facility	39%
	Identify skilled provider	6%
	Identify mode of transportation	74%
	Save money for delivery, complications	82%
	Identify birth companion	34%
	Identify blood donor	3%
	Prepare clean items for birth	94%
	Reports & documents	24%

Table 3
Distribution of subjects by postpartum care – knowledge.

Some serious health problems that can occur during the first 2 days after birth that could endanger the life of the woman:		
Key Danger Signs	Severe vaginal bleeding	95%
	Malodorous vaginal discharge	17%
	High fever	22%
Other Danger signs	Convulsions	19%
	Severe headache	19%
	Blurred vision	5%
	Loss of consciousness	21%
	Difficulty breathing	1%
	Severe weakness	21%
	Swollen hands/face	4%
	High BP	64%
	Infection of stitches	12%
In your opinion could a woman die from any of the above-mentioned problems?		88%
Basic care that can be provided to a newborn baby immediately after birth	Early breastfeeding (within 1 h)	94%
	Exclusive breastfeeding	55%
	Dry and wrap	88%
	Cord care	15%
	Kangaroo Mother Care (KMC) for LBW babies	12%
	Feeding the first milk (colostrum) to the baby	9%
Postpartum checkup after childbirth	Once at 3 weeks	33%
	Once at 6 weeks	1%
	3 times: at 6 h, 6 days, and 6 weeks	3%
	Any time she has danger signs	28%
	Only if she has danger sign	35%
Advise to the mother during postpartum visit	Rest for at least 6 weeks	27%
	Eat more nutritious food	85%
	Exclusive breastfeeding for 6 months	83%
	Need for contraception methods	15%
	Personal hygiene	36%
Advice regarding baby care after childbirth	Dry the baby and keep the baby warm	100%
	Delay first bath for the baby for at least 6 h	33%
	Cord care	24%
	Hygiene	17%
Advice regarding breastfeeding	Start breastfeeding within 1 h after birth	93%
	Exclusive breastfeeding for 6 months	80%
	Breastfeed as and when the baby needs it	70%
	Correct position for breastfeeding	58%
	Burping after breastfeeding	21%

about eating nutritious food (85%) and exclusive breastfeeding for 6 months (83%). Only 15% of them advised regarding contraception methods, 17% regarding hygiene and 24% regarding cord care.

Table 4: There was a significant increasing linear trend in proportion of Knowledge score "≥4" over level of education using Chi Square test (p-value - 0.0092). Receiving training within last 3 months was not significantly associated with knowledge about key danger signs.

4. Discussion

The present Cross Sectional Study was conducted with an objective to assess the knowledge of ASHAs regarding intranatal and postnatal care services and to estimate the association between knowledge and sociodemographic profile of ASHAs. In India, with the introduction of ASHA workers under the National Rural Health Mission (NRHM) from 2005, utilization of healthcare services at the peripheral level has

Table 4
Association between knowledge of intranatal and postnatal care services and sociodemographic profile of ASHAs.

Factors	Sub-category	Scores for knowledge of key danger signs		P-value
		≥4 (n = 46)	<4 (n = 54)	
Age	<30 years	4 (44.44%)	5 (55.56%)	0.9147
	30–39 years	30 (46.88%)	34 (53.13%)	
	40–49 years	10 (41.67%)	14 (58.33%)	
	≥50 years	2 (66.67%)	1 (33.33%)	
Level of education	Primary	4 (22.22%)	14 (77.78%)	0.0092*
	Secondary	34 (49.28%)	35 (50.72%)	
	Undergraduate	7 (58.33%)	5 (41.67%)	
	Graduate	1 (100%)	0 (0%)	
Work experience of ASHA	6–12 months	3 (33.33%)	6 (66.67%)	0.1127
	13–24 months	2 (28.57%)	5 (71.43%)	
	25–36 months	1 (16.67%)	5 (83.33%)	
	>36 months	40 (51.28%)	38 (48.72%)	
Rounds of training	1 round	3 (60%)	2 (40%)	0.2486
	2 rounds	1 (20%)	4 (80%)	
	3–4 rounds	12 (34.29%)	23 (65.71%)	
	>4 rounds	30 (54.55%)	25 (45.45%)	
Any training in last 3 months	Yes	20 (51.28%)	19 (48.72%)	0.3968
	No	26 (42.62%)	35 (57.38%)	

improved.[9] ASHA is a female volunteer selected by the community, deployed in her own village (1/1000 population) after a short training on community health.[8] Studies on intranatal and postnatal care services are very limited in India and nonexistent in the study area.

Most of the ASHA workers are having very less knowledge regarding intranatal and postnatal care services. Skill based training is not provided to ASHA workers which is a hindrance for their knowledge and practice. Incentive provided for them is also negligible compared to their workload.[1] They are overburdened with other works apart from Mother and Child Health services. There are many gaps in understanding of intranatal and postnatal care services by health care workers and provision of essential services towards intranatal and postnatal care. Hence the current research is aimed to address gaps in understanding of intranatal and postnatal care services.

The results of the present study showed that majority of the ASHA workers were middle aged and married. A study by Kochukuttan S et al. showed that mean age of ASHAs was 30–35 years, 90% were married.[7] Findings from a study conducted in Delhi also showed that majority of the participants were from the age group of 25–45 years and were married.[11]

In the present study 69% of ASHAs completed secondary level of education. Similarly a study conducted by P. K. Garg et al. in rural Haryana showed most of ASHA workers had completed minimum 8th std.[4] A study by Swati S. et all also showed 65% of secondary level of education.[12]

A study from Aligarh showed that 88% ASHAs had knowledge about excessive vaginal bleeding.[10] A study conducted by P. K. Garg et al. in rural Haryana showed 78% ASHAs had knowledge about excessive vaginal bleeding.[4] Similarly in present study also more than 80% of the ASHAs were aware about excessive bleeding as complication.

A study by Swati S. et all showed that majority (71%) of ASHA workers were aware about the fact that exclusive breastfeeding should be done up to 6 months.[12] Similarly in our study also 83% of ASHAs were aware of exclusive breastfeeding. Present study revealed that 93%

of ASHAs knew about early initiation of breastfeeding, similarly 83.5% of ASHAs knew in a study conducted by Fatima F. N. et al.[16]

In a study by Baghel A et al., 58.9% of ASHAs reported to have 5–10 years of work experience.[13] Similarly in present study also 78% of ASHAs had 3–10 years of experience.

Present study showed that only 15% of ASHAs had postpartum knowledge about contraceptive methods. Similarly Das A. et al. showed that only 20% ASHAs had contraceptive knowledge.[14]

Present study revealed that only 12% of ASHAs had knowledge about prolonged or obstructed labor whereas Kori S. et al. showed that 88.6% ASHAs were aware about obstructed labor which is in contrast with present study.[15]

Strengths of the study: Present study was carried out in an appropriate manner following all the necessary steps. Ethical approval (Human) and permission from Department of Health and Family Welfare Services (RCH), Karnataka was obtained to conduct the study.

Limitation of the study: Due to resource constraints only 2 PHCs and 1 CHC was included and limited number of participants were interviewed.

This study is an initiation to carry out an interventional study which will be conducted by the researcher in near future.

5. Conclusion

ASHAs are the most important activists/key workers in maintaining the health of women during pregnancy, childbirth and postpartum period especially in rural areas where health facilities are scarce. More than 80% of ASHAs were aware of severe bleeding as key danger sign, more than 65% were aware about high BP but their knowledge regarding other key danger signs like - prolonged labor, retained placenta, swollen hands/face, blurred vision, convulsions, high fever, severe headache was negligible. Knowledge regarding cord care, Kangaroo Mother Care, colostrum feeding, contraception, burping and hygiene was also very low. Hence need of the hour is to train ASHAs regarding intranatal and postnatal care services.

Ethical approval

Obtained from Ethical Committee (Human) for Ph.D Research, KAHER, Belagavi.

Consent to participate

Obtained.

Consent for publication

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Declaration of competing interest

The authors declare that they have no conflict of interest.

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