“Correlation of Vitamin B12 deficiency with sensory motor deficit in post menopausal women- cross sectional observational study”

By

REG NO- BJ0121010

DISSERTATION

Submitted to the
KAHER, Belagavi, Karnataka
In partial fulfilment
of the requirements for the degree of

MASTER OF SURGERY (M.S)
In
OBSTETRICS AND GYNECOLOGY

Under the guidance of
DEPARTMENT OF OBSTETRICS AND GYNECOLOGY

J.N. MEDICAL COLLEGE, NEHRU NAGAR
BELAGAVI- 590010

DECEMBER 2024-JANUARY 2025

KLE ACADEMY OF HIGHER EDUCATION AND RESEARCH, BELAGAVI, KARNATAKA

DECLARATION BY THE CANDIDATE

I hereby declare that this dissertation entitled "**Correlation of Vitamin B12 deficiency with sensory motor deficit in post menopausal women-cross sectional observational study**" I s a bonafide and genuine research work carried out by me, under the guidance of Department of Obstetrics and Gynecology, J.N. Medical College, Belagavi.

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Sub: Institutional Ethical Clearance for the study.

With reference to the above, we wish to inform you that your proposed research project titled **"CORRELATION OF VITAMIN B12 DEFICIENCY WITH SENSORYMOTOR DEFICITS IN POST MENOPAUSAL WOMEN- A ONE YEAR CROSS SECTIONAL OBSERVATIONAL STUDY."** is ethical and justifiable. The proposed research project has been cleared by the JNMC Institutional Ethics Committee.

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LIST OF ABBREVIATIONS USED

DNA Deoxyribose nucleic acid

Vit-vitamin

BMD- Bone Mineral Density

RBC-Red Blood Cells

CNS-Central Nervous System

NIH-National Institute of Health

STRAW-Staging of Reproductive Age Group Workshop

Hz-Hertz

OPD- Out Patient Department

SPSS- Statistical Package for Social Sciences

UL-Upper Limb

LL-Lower Limb

ABSTRACT

INTRODUCTION: Post-menopausal women are prone to develop vitamin B12 deficiency, which can effect neurological health. Sensorimotor deficits, which affect sensory and motor functions, are common in India and can lead to accidental falls, reduced mobility, and decreased quality of life. The studies aim is to investigate the correlation between vitamin B12 deficiency and sensorimotor deficits in post-menopausal women.

MATERIAL AND METHODS: The study was conducted, focusing on post menopausal women attending the outpatient department (OPD). This cross-sectional observational study investigated sensorimotor deficits in 100 post-menopausal women meeting the inclusion criteria. Exclusions included histories of orthopedic surgeries, paralysis, thalassemia, diabetes, and uncontrolled hypertension. Blood samples were collected to assess vitamin B12 levels Sensorimotor assessments included pain evaluation with an algometer, crude touch, temperature sensation with a tuning fork and warm water, position sense with eyes closed, vibration sense with a tuning fork, discriminative sense tests, coordination assessments, and muscle evaluations

for bulk, symmetry, tone, strength (graded by the Medical Research Council scale), and reflexes in both limbs.

RESULTS: 18% of postmenopausal women were found to have a deficiency in vitamin B12, while 82% did not have a deficiency. Among patients with vitamin B12 deficiency, sensory deficit was present in-52.9% patients and motor deficit was present in- 33.3% patients . The association between them was found to be statistically significant. Among patients with vitamin B12 deficiency, sensory and motor deficit was present in 32% patients. The association between them was found to be statistically significant.

CONCLUSION: In this study we conclude that the association of sensory and motor deficits with Vitamin B12 deficiency was found to be statistically significant. The prevalence of vitamin B 12 deficiency in post menopausal women is 18%.

KEYWORDS: Sensory, Motor, Vitamin B12, Postmenopausal Women.

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INTRODUCTION

Vitamin B12, which is often referred to as cobalamin, is an essential component in a number of physiological processes, including hematopoiesis, the synthesis of DNA, and the development of neurological function. Vitamin B12 insufficiency can appear as one of the many neurological manifestations, including peripheral neuropathy, subacute combined degeneration of spinal cord, cognitive impairment and mental symptoms. These manifestations range from mild to severe.[1,2]

Menopause in defined as the time of final menstrual period at the end of reproductive period followed by 12 months of amenorrhea.

It is commonly associated with symptoms like hot flushes, increased irritability, mood swings, insomnia, dry vagina, difficulty in concentration, confusion, urinary incontinence, urge incontinence, osteoporotic symptoms and depression.

Women who have gone through menopause are more likely to suffer from nutritional deficiencies, including vitamin B12 deficiency, as a

result of type of dietary habits, changes in the gastrointestinal tract, and a reduction in the efficiency of absorption.

As many symptoms of post-menopausal syndrome overlap with that of vit B12 deficiency symptoms, it is important to see the prevalence of vitamin B12 deficiency in postmenopausal women as it will help detect patients who can be treated with vitamin B12 supplements and alleviation of symptoms.

In postmenopausal women, the prevalence of vitamin B12 deficiency varies from population to population with studies indicating percentages that range from 6% to 30% or even higher. Due to the vast range of possible outcomes, it is necessary to have a comprehensive understanding of the factors that contribute to vitamin B12 insufficiency in this particular population and the therapeutic consequences of this condition.[3]

There have been many studies done that have been conducted to study the connection between a lack of vitamin B12 and neurological dysfunction in a variety of populations, including people who are older and people who have underlying medical disorders.

However, limited research specifically focuses on the correlation between vitamin B12 deficiency and sensorimotor deficits in post-menopausal women.

REVIEW OF LITERATURE

In Indian women, the average age at which they experience menopause ranges from 48 to 55 years. Early menopause is a condition that affects some women between the ages of 45 and 50, whereas "premature menopause" is a condition that happens naturally in some women before the age of 40. Both of these conditions are observed in certain women. Research has shown that women who are post menopausal are at a higher risk of developing a number of health problems, including as osteoporosis, cardiac diseases, obesity, and other conditions. There have been a few studies conducted on the postmenopausal health status of women from various regions of the world; however, there has not been a significant amount of research conducted in South East Asian countries. In India, number of women who have gone through menopause is also growing, which can be attributed to the country's growing population. Because of this, postmenopausal women's health concerns are receiving a lot of attention in India[4]. It has been noted that women from various regions of India exhibit a substantial number of menopausal symptoms[5,6]. The

postmenopausal health problem culminates in three primary ailments, which include a loss in BMD, problems with the heart, and psychological concerns. According to research carried out on women in the northern region of India, the average age at which they experienced menopause was between 44 and 54 years old. According to the findings of a study, the most common postmenopausal health problems that were detected among North Indian women were arthritis and hypertension[5]. Women living in rural areas are the most neglected, and they are the ones who suffer the most from menopause and post menopause-related health problems. Additionally, there are not a lot of research that have been done on the postmenopausal health issues that rural women in India face, despite the fact that they make up the bulk of the women population. The limited number of studies that have been undertaken on postmenopausal women living in rural areas highlights the necessity of doing additional research of this kind, particularly on rural women, in order to address the health concerns of postmenopausal women and to incorporate some essential elements into national health health programmes[4]. Despite the fact that there are some research, the primary goal of these investigations was to evaluate and comprehend

the mental and physical health of women who have reached menopause[7]. The menopause phase, on the other hand, only lasts for a few years, whereas the postmenopausal phase and the associated health problems are something that women continue to experience until the moment they pass away after menopause. Therefore, the health status of a woman after menopause is the factor that determines the health of an elderly woman, as well as the morbidity and mortality rates of the elderly and elderly female population of community, and it also has an impact on the overall socio-health status of the inhabitants of the community. In urban and rural parts of the India, women who have gone through menopause and women who have gone through postmenopause experience different patterns of health problems, according to the findings of several studies[8]. According to the findings, these disparities could be the result of differences in environmental conditions, lifestyle choices, levels of education, levels of awareness and concern over the issue and socioeconomic status. After menopause, women often experience a number of substantial psychological changes that can be damaging to their mental health, including a decrease in patience, an increase in irritability, depression, and other

similar symptoms[9]. It is possible for them to go through a variety of physiological changes, including hot flashes, inability to sleep, night sweats, vaginal dryness, and mood swings. Although not everyone has these symptoms, a significant number of people may discover that they are a source of inconvenience and discomfort for them. Overcoming some of these changes during menopause may be possible with the help of an adequate dose of B vitamins[10,11].

In persons above the age of sixty, the frequency of vitamin B12 deficiency is commonly thought to be somewhere around twenty percent, but it could be as high as forty percent. It is possible that older persons who are institutionalized and have many comorbidities are at a higher risk; some studies have reported a prevalence of thirty to forty percent. For the production of healthy red blood cells (also known as erythropoiesis), vitamin B12 is absolutely necessary. In addition to this, it is a significant part in the production of deoxyribonucleic acid (DNA), the growth of nerves, and the preservation of the function of the central nervous system. In three of the most important enzyme reactions, it is a required cofactor.

These reactions are

1. conversion of methylmalonic acid to succinyl coenzyme A,
2. conversion of homocysteine to methionine, and the conversion of 5-methyltetrahydrofolate to tetrahydrofolate.

Reductions in these processes lead to an accumulation of the substrates methylmalonic acid and homocysteine in the plasma, as well as a reduction in release of the active folate, which ultimately results in poor DNA and mitochondrial cell production. This can occur when there is a deficit in vitamin B12.[12]

VITAMIN B12 ABSORPTION, METABOLISM, STORAGE, AND EXCRETION[12]

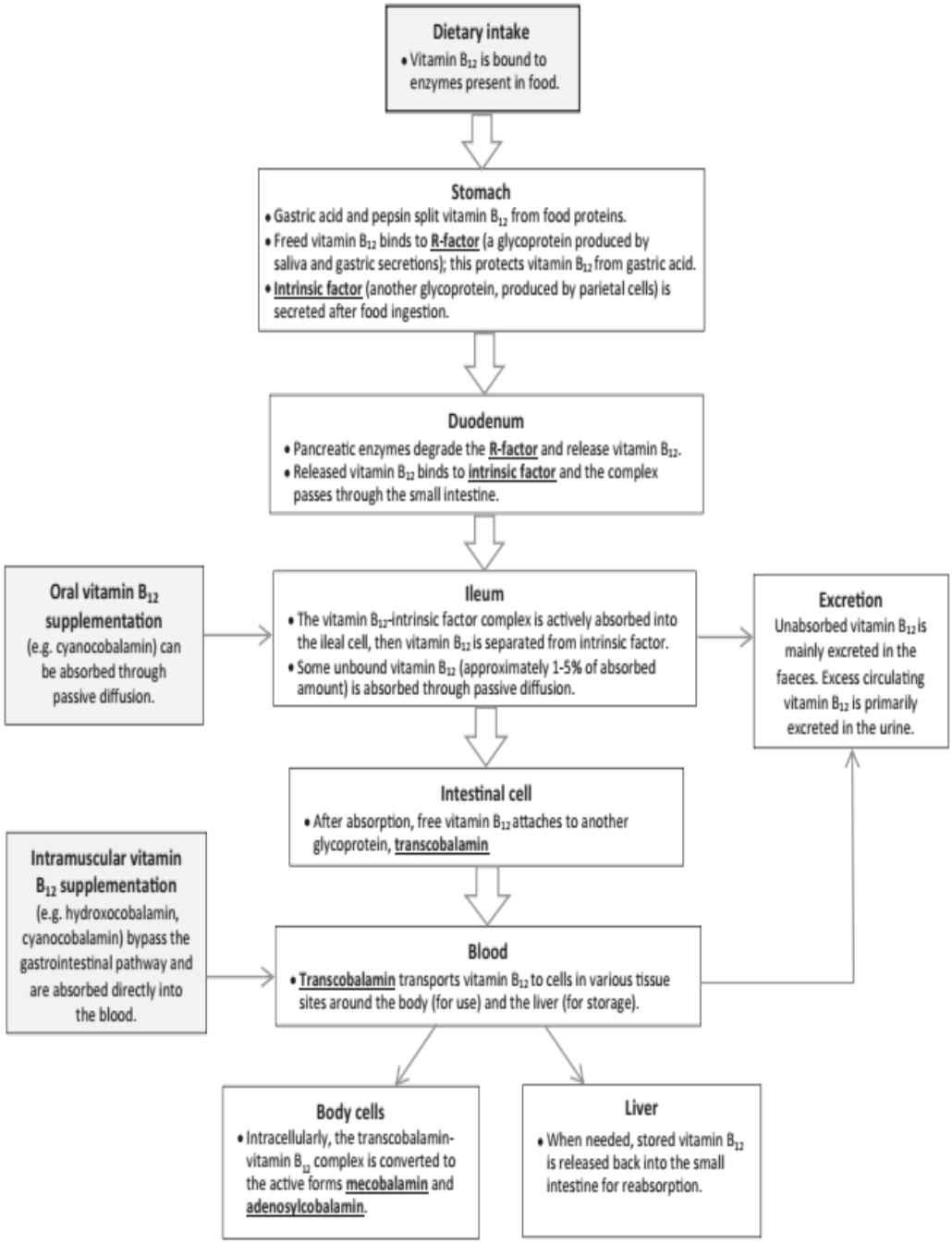


Figure 1 Vitamin B12 -Absorption, metabolism, storage, and excretion[12]

CAUSES OF VITAMIN B12 DEFICIENCY IN OLDER PEOPLE[12]

Inadequate or restricted intake

- Malnutrition
    - Eating disorders
    - Chewing /swallowing problem
    - Difficulties with accessing or purchasing food
- Vegetarian /vegan diet
- Religious / cultural beliefs relating to intake of animal products
- Increased alcohol consumption

Impaired absorption

- Impaired gastric absorption
    - Pernicious anaemia
    - Atrophic gastritis
    - Chronic Helicobacter pylori infection
    - Zollinger–Ellison syndrome
    - Gastrectomy / gastric resection

Weight-loss surgeries such as gastric bypass or duodenal switch surgery

Impaired intestinal absorption

- Ileal diseases such as inflammatory bowel disease, Crohn's disease, coeliac disease
- Ileal resection
- Infection such as tapeworm, giardiasis, Whipple's disease, bacterial overgrowth

Pancreatic insufficiency

- Chronic pancreatitis

Medications

- Proton pump inhibitors (use >12 months)
- Histamine H2 receptor antagonists (use >12 months)
- Metformin (use >4 months)
- Colchicine
- Cholestyramine
- Antibiotics (e.g. aminoglycosides)
- Nitrous oxide

Defective transport

- Transcobalamin deficiency (genetic)

CLINICAL PRESENTATION OF VITAMIN B12 DEFICIENCY[12]

Haematological

- Anemia (macrocytic /megaloblastic)
- Dyspnea, shortness of breath
- Lethargy, weakness
- Skin discoloration (pallor, hyperpigmentation)
- Thrombocytopenia, neutropenia, pancytopenia

Neurological

Paresthesia, numbness of hands and feet

Peripheral neuropathy

Gait abnormalities, ataxia

Cognitive impairment

- Memory loss
- Dementia

- Delirium, acute psychosis

- Depression,
- Agitation
- Optic atrophy
- Subacute combined degeneration of the spinal cord

Digestive

- Nausea, vomiting, stomach pain
- Diarrhea
- Reduced appetite, weight loss
- Angular stomatitis (inflammation and cracks in corners of the mouth)
- Glossitis (pain, swelling and/or hyperpigmentation of the tongue)
- Lactate and bilirubin elevation
- Jaundice

There is a minor, subclinical deficiency that is found through incidental laboratory findings in the majority of elderly adults. This deficiency is typically asymptomatic. It is possible to experience symptoms that are not specific, such as nausea, vomiting, diarrhea, and stomach discomfort. This would make the initial diagnosis challenging. Although anemia and neuropathy are considered to be classic symptoms, they are not very prevalent.[12]

Hematological Features[12]

Severe deficiencies in vitamin B12 can lead to the development of anemia. This condition typically manifests itself as macrocytic or megaloblastic anemia, which is characterized by abnormally large red blood cells, low hemoglobin levels and high mean cell volume. Additionally, folate insufficiency is frequently present in combination with this condition. The symptoms that patients may present with include exhaustion, lethargy, headaches, lightheadedness, and weight loss that cannot be explained. Symptoms that are caused by tissue hypoxia and organ ischemia, such as chest discomfort, shortness of

breath, tachycardia, and skin pallor, might manifest themselves in cases of severe anemia.

Neurological Features

Paresthesia, also known as numbness, in the hands and feet, as well as gait issues, are the most prevalent neurological symptoms that are related with a lack of vitamin B12. In addition to these symptoms, peripheral neuropathy, visual problems, and memory loss are also being experienced. Low serum vitamin B12 levels were shown to be associated with a two- to fourfold greater risk of cognitive impairment, according to the findings of one study. Cognitive decline, dementia, psychosis, mania, agitation are all possible outcomes of this condition. The severe form of vitamin B12 deficiency can lead to the development of degeneration of the spinal cord and paralysis, both of which can be permanent if the condition is not addressed by medical professionals. [12]

Derivatives and co-enzymes of vitamin B complex are essential for a wide variety of metabolic and enzymatic activities, as well as the creation of energy, methylation, immunological function, DNA repair and the preservation and normal functioning of the neurological system. In addition to being a necessary water-soluble vitamin that can

be found in a wide variety of foods, but none of which can be synthesized in sufficient quantities by humans, B vitamins play a significant part in the health and wellness of people all over the world. The insufficiency of vitamin B during menopause is still a problem in many countries, despite the fact that numerous fortification programs have been implemented. This may be the result of inadequate consumption, malabsorption, or the interaction of medications with the metabolism of members of the vitamin B complex. [13]

A deficiency in the B complex vitamins, which mostly consist of thiamine (B1), pyridoxal (B6), folate (B9), and cobalamin (B12), can lead to alterations in the network of the one-carbon metabolism. Additionally, they are co-factors for the metabolic pathways of carbohydrates, lipids, and proteins that are responsible for the production of energy.. In addition to this, it has the potential to further enhance the likelihood of acquiring degenerative diseases, cognitive impairment, cardiovascular disease, and osteoporosis. B vitamins, in addition to vitamin D, play a significant role in the formation and maintenance of healthy bones in an individual. When it comes to the metabolism of homocysteine, the cofactors that are involved are

vitamins B6 (pyridoxal), B9 (folate) and B12 (cobalamin). Therefore, a lack of these vitamins causes an increase in the amount of homocysteine that is found in the blood. Hyper-homocysteinemia is one of the most significant risk factors for cognitive impairment, cardiovascular disease, and bone loss, which is the most prevalent and frequent consequence in post-menopausal state. [13]

In women who have gone through menopause, osteoporosis is one of the issues that might arise as result of a decrease in oestrogen. The independent risk factors for bone loss are an increase in homocysteine levels and a decrease in the quantities of B vitamins. A decline in vitamin B12 status, which is mostly evaluated by plasma levels, is linked to a lower BMD as well as increased risk of fractures. It is possible that a lack of vitamin B and vitamin D could be the cause of the higher risk of fractures in women. This risk is most commonly observed in the hip, wrist, and spine. On the other hand, there is no correlation between the incidence of hip fractures and the consumption of vitamin B12 or folic acid. [13]

A high dose of vitamin B6 was shown to be associated with an increase in the number of hip fractures, according to the findings of a large-scale

randomised control trial research[14]. There is a correlation between a lack of B vitamins and depressive disorder, and menopause is one of the symptoms that might be associated with this condition. It has been discovered that the administration of folic acid in conjunction with antidepressant medication is more effective. There have also been reports suggesting the presence of vitamin B is linked to Alzheimer's disease and dementia. This condition has the potential to hasten the deterioration of cognitive abilities if it is not addressed, and it can also result in irreparable harm to the nervous system. [13]

Existence of B vitamins has a significant bearing on one's health. The primary causes of vitamin deficiencies are a habit of eating and a reduction in the body's ability to absorb various nutrients. During menopause, women are more likely to have a variety of health issues, including bone loss, cardiovascular issues, cognitive impairment, dementia, and other similar conditions. [13]

According to Porter et al.,[15] the findings of investigations on the association between folate and B-vitamin levels and the development of cognitive dysfunctions in investigated groups of patients vary significantly depending on the location of study. This is the case

regardless of whether the studies were conducted in the United States or anywhere else. Evidence of these correlations was far more readily apparent in the nations that did not implement the practice of food fortification. In addition, many studies have associated low vitamin B 12 concentration with cognitive dysfunction and cognitive decline in menopause and in older age. The studies conducted in groups with lower baseline folate status have suggested that there is a correlation between folate and cognitive dysfunction. Similarly, a lower amount of vitamin B6 was found to be associated with cognitive impairment and cognitive decline as well as lower risk of Alzheimer's disease. As a result of meta-analyses of observational studies, the relationships between increased homocysteine and BMD and fracture risk in menopause have been established. According to the findings of one meta-analysis[16], homocysteine was found to be an risk factor that was associated with bone fracture independently. Low bone mineral density (BMD) related with reduced amounts of folate, vitamin B12, and vitamin B6. [17]

In a study conducted by Yazdanpanah and colleagues[18], it was discovered that a low intake of vitamin B2 in women who had reached

menopause was associated with 1.8 times increased risk of osteoporotic facture and 2.6 times increased risk of fragility fractures. In light of the fact that the incidence of diseases affecting the vascular system, disorders of brain functioning, and incorrect bone metabolism is on the rise, it would appear that the evaluation of folate and B vitamins ought to be incorporated into the appropriate medical treatment that is provided to a woman who is going through menopause. [16]

In older adults, a lack of vitamin B12 can be caused by a wide variety of various factors. Food- cobalamin malabsorption, which is characterized as decreased digestion and absorption of protein bound B12, is present in more than half of the elderly people who are deficient in B12. Inadequate intake of B12, whether through diet or supplements, pernicious anemia, gastric surgery, gastrointestinal disease, and some drugs (such as proton-pump inhibitors and metformin) are all potential reasons of low or deficient levels of B12. It has been established via clinical research that a lack of vitamin B12 is linked to neurological conditions such as dementia, cognitive impairment and depression. B12 deficiency has been linked with peripheral neuropathy, loss of

sensation in peripheral nerves, and weakness in lower extremities in older persons. It is also possible that B12 deficiency causes demyelination of nerves in central nervous system as well as the peripheral nervous system. In particular, a lack of vitamin B12 is linked to neuropathy of the large fiber variety, often known as type A neuropathy. Nerve fibers of type A function as both sensory and motor fibers. Therefore, vitamin B12 may be related with the operation of both the sensory and motor systems of the peripheral nerves. There is a significant incidence of neuropathy and poor peripheral nerve function I the elderly, and this prevalence increases with more years of age. There is a correlation between poor peripheral nerve function and reduced levels of strength, bone mineral density, and physical performance in elderly women. This condition is frequently untreated or occurs at subclinical levels. It is of the utmost importance to identify the risk factors caused by impaired peripheral nerve function. There is a lack of knowledge on the connection between low B12 levels and subclinical sensory and motor peripheral nerve function in older adults, despite the fact that B12 deficiency is an established risk factor for clinical peripheral neuropathy. [19]

LITERATURE FROM PREVIOUS STUDIES:

According to Samuel S. et al. (2022), menopause is a natural that occurs in women as they become older and is associated with the ageing process. In most cases, women reach menopause between the ages of 40 and 58. During this time, they experience several physiological changes that can have an effect on their day-to-day activities. It is primarily the pattern of eating, absorption, and blood loss that are responsible for the lack of B vitamins. This deficiency can lead to a variety of health issues, including cognitive decline, osteoporosis, and physical and mental imbalance. Within the scope of this review, the published evidence about status of vitamin B and its influence on post-menopausal women was assessed. Using Prisma standards, chosen data sources were searched for relevant literature (2010-2020), and the results were incorporated in accordance with the criteria that were established. For the purpose of rating the publications, the NIH quality questionnaire instrument was utilized. In conclusion, eleven articles were selected for inclusion in the comprehensive evaluation. These articles contained information on the influence of B vitamins on bone loss, cognitive decline, and physical activity. According to the evidence

that is currently available, there is no correlation between bone loss and using B vitamins. There are only a few of research that have reached a conclusion on the association between B vitamins and cognitive decline as well as physical health. To remedy this research gap, additional investigations are required to be conducted.[13]

The purpose of the review that Malik A et al., (2020) carried out was to compile the most recent information regarding the vitamin B12 status of the healthy Indian adult and senior population. A search was conducted on the online database Pubmed to find papers that were published in English between the years 2000 and 2019. The inclusion criteria consisted of original studies that were carried out on an Indian population that was apparently healthy and consisted of adults and elderly people and reported serum or plasma levels of vitamin B12. A thorough search of the relevant literature uncovered fourteen papers that were suitable for inclusion. Depending on the cutoffs that were used, the prevalence of deficiencies reached 78.5% among adults and 61.7% among the elderly, respectively. Women were found to have Vitamin B12 levels that were higher than those of men. It was found that females had a lower prevalence of hyper homocysteinemia (Hcy.15

mmol/L) compared to males (60 percent versus 90 percent, 14.9% versus 57.4%, and 3.6% versus 20.9%, respectively, in three investigations). In vegetarians, the prevalence of vitamin B12 insufficiency was greater. According to the findings, the lack of proper vitamin B12 status is a widespread issue that affects the people of India. However, there are a range of laboratory methodologies and cut-offs of vitamin B12 deficiency, as well as variability in the results, which makes it difficult to draw definitive conclusions regarding the level of vitamin B12 deficiency and its prevalence in India. [20]

Ghosh D et al., (2019) conducted one study with the purpose of providing a summary of the various health problems that are associated with postmenopausal Indian women, addressing the various factors that are specific to Indian women and are involved in postmenopausal health problems, discussing the differences in socioeconomic, nutritional and health status between Indian women from rural regions and urban regions, and discussing the potential preventative measures that can be taken against postmenopausal health problems. After menopause, a woman's body undergoes a series of changes that are detrimental to her health and can result in a number of different health

problems. Even though some of the health problems that a woman experiences during the beginning of menopause, such as amenorrhea, night sweats, mood swings, cramp pains, and so on, gradually decrease as her days progress, there are still some new detrimental gradual changes that occur in her physiological system during the postmenopausal periods. [21]

The purpose of the research that was carried out by Leishear K and colleagues (2012) was to investigate whether or not a deficient B12 status or low serum B12 levels are linked to a decline in the sensory and motor peripheral nerve function of older persons. Seven percent of the population was found to be deficient in B12, and an additional ten percent had low serum B12 levels. After making multivariable adjustments for demographics, lifestyle factors, and health problems, the presence of a B12 deficiency was found to be associated with a larger insensitivity to light (1.4g) touch and a poorer neurological complication. In the alternate criteria, which solely considered low serum B12 levels, associations were shown to be constant. There were no significant connections detected between vibration detection, nerve conduction amplitude, or peripheral neuropathy symptoms and either

the deficient B12 status or the alternative low serum B12 criteria. The researchers came to the conclusion that poor B12, which includes both an inadequate B12 status and a low serum B12 level, is linked to impaired sensory and motor peripheral nerve function. As a result of the fact that nerve function impairments might result in a reduction in physical function and disability in older persons, it is vital to assess the possibility of preventing and treating low levels of potassium and vitamin B12. [19]

AIM & OBJECTIVES

- To determine the correlation of vitamin B12 deficiency with sensory motor deficits in post-menopausal women.
- To determine the prevalence of vitamin B12 deficiency in post-menopausal women.

MATERIAL AND METHODS

STUDY AREA: The present study was carried out in the Department of Obstetrics & Gynaecology, KLE'S Dr Prabhakar Kore hospital.

STUDY POPULATION: Post-menopausal woman who come to OPD at KLE'S Dr Prabhakar Kore hospital and medical research centres.

STUDY DESIGN: This is a hospital based, cross sectional observational study.

SAMPLE SIZE:

- Formula used for sample size calculation is

$$n = \frac{p(100-p)Z^2}{d^2}$$

- n is the sample size required, p is the percentage occurrence of a state or condition (proportion or prevalence), d is the percentage maximum error required,

Z is the value corresponding to level of confidence required.

- We assume that, 50% of the postmenopausal women have vitamin B12 deficiency.
- With percentage of maximum error as 10% at 95% confidence level sample size is given by,

$$n = \frac{50 \times (100 - 50) \times (1.96)^2}{10^2}$$

$$n = 96.04 \approx \mathbf{96}$$

- Minimum sample size required is 96, with 95% confidence level and with 10% error. Larger the sample size, better the precision.

STUDY PERIOD: January 2023 to February 2024

INCLUSION CRITERIA:

- Post menopausal women

EXCLUSION CRITERIA

- Women with h/o orthopedic surgeries.

- Women with h/o stroke/paralysis.
- Women with thalassemia
- Women with diabetes.
- Women with uncontrolled hypertension.

METHODOLOGY:

Post-menopausal women coming to OPD of KLE Prabhakar Kore hospital were screened for the inclusion criteria and recruited in our study.

- 3.5 ml venous blood was collected in plain vaccutainer and sent for vitamin B12 levels

For assessment of sensorimotor deficit, we conducted basic clinical examinations to assess the different components of sensory and motor system

- The following tests were conducted to access the sensorimotor deficit, if any one of them is positive then patient in considered to have either sensory or motor deficit.
- Pain: Pain was tested using an algometer. The algometer probe was applied to the hands and legs, first on the right and then on the left side dermatomally and for uniformity. The algometer served as a visual analogue scale.
- Crude touch: Crude touch was assessed by lightly stroking the skin over the dermatomes using fingertips or a wisp of cotton. It

was determined if the patient felt this symmetrically in all areas tested.

- Temperature: To assess cold sensation, the cool ends of a tuning fork were applied to the skin in the specified areas. For warm sensation, a container filled with warm water was utilized.
- Position sense: Position sense was evaluated with the patient closing her eyes. The ability to determine the direction of movement was tested by moving the great toe upward or downward. It was important to grasp the digit on both sides, both on the top and bottom, while moving it. This process was repeated several times on each side of the upper and lower extremities using the thumb and great toe.
- Vibration: Vibration sense was tested on each side using a 128 Hz or 256 Hz tuning fork. The vibrating tuning fork was placed on the bony prominence of a finger or toe, and the patient was asked to describe what they felt. Once the subject confirmed that the vibration had stopped, it was compared with the examiner's own vibration sense at the corresponding point to confirm.

- Discriminative sense: Discriminative sense was evaluated using three tests: two-point discrimination, tactile localization, and figure writing.
- Two point discrimination using astheisometer - In the test for two-point discrimination using an aesthesiometer, the patient was asked to close their eyes. The two metallic blunt ends of the instrument were then placed at the tip of the patient's thumb. The patient was asked whether they could perceive the two tips as two points or one point. If the patient could perceive two tips when the tips were apart by 2 cm or less, then the two-point discrimination was considered intact.
- Co-Ordination: Coordination was assessed through various tests including gait analysis, the finger-to-nose test, rapid alternating actions, and the heel-to-shin test.
- Evaluation of Muscles: Muscle evaluation involved inspecting muscles at rest for bulk and symmetry. Any involuntary movements such as tremors, tics, or fasciculations were noted.
- Muscle tone was done by evaluating the muscle's resistance to passive stretch, with recognition of normal variation. To conduct

this assessment, the examiner flexed and extended the patient's elbow, wrists, knees, and ankle joints. If decreased resistance was suspected, the forearm was held and hand was shaken back and forth loosely.

- Is assessed by feeling the muscle's resistance to passive stretch. There is a considerable degree of normal variation. To test this, flex and extend the patient's elbow, wrists, knee, and ankle joints. If decreased resistance is suspected, hold the forearm and shake the hand back and forth loosely.
- Reflexes were assessed in both the upper and lower limbs.

STATISTICAL ANALYSIS:

Data entry was performed using Microsoft Excel, and statistical analysis was conducted using the Statistical Package for Social Sciences (SPSS Version 16) for Microsoft Windows. Descriptive statistical analysis was employed to explore the distribution of both categorical and quantitative variables. Categorical variables were summarized with frequencies and percentages (%), while quantitative variables were summarized using mean ± standard deviation (SD). Results were presented in tabular form and graphically using appropriate diagrams such as bar or pie charts. Inferential statistics were utilized to test the difference between the two groups for statistical significance. Categorical variables were tested using the chi-square test. A p-value of less than 0.05 was considered statistically significant, following all the relevant rules of statistical tests.

ETHICAL ISSUES

- The objectives and procedures of the study were explained in detail to all patients.
- Informed consent was obtained from all patients willing to participate in this study.

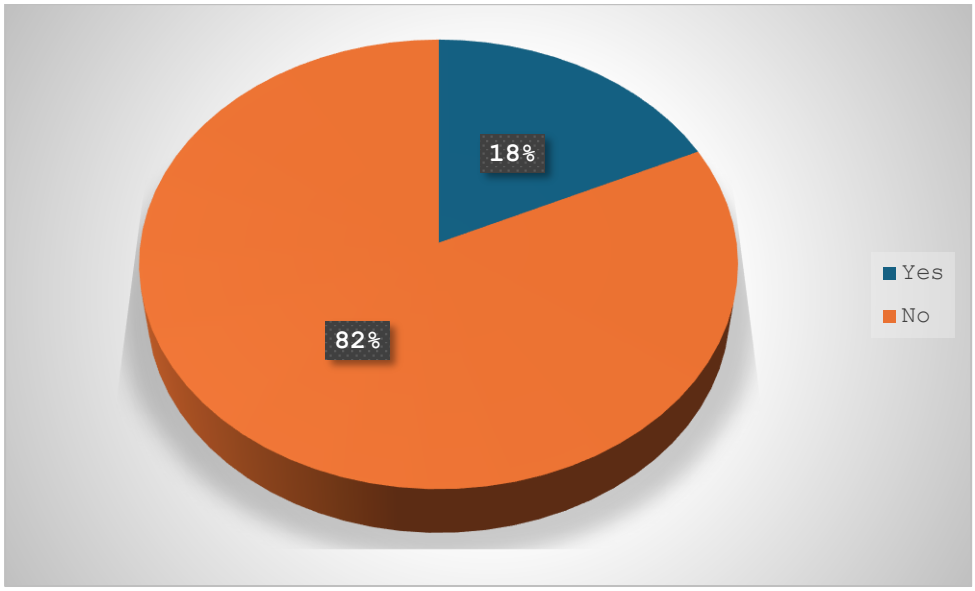
- The option to opt out of the study was provided .
- Complete confidentiality regarding patient information was maintained throughout the study.

RESULTS & OBSERVATIONS

TABLE 1: DISTRIBUTION OF PATIENTS BASED ON THE VITAMIN B12 DEFICIENCY

		Frequency	Percent
Vitamin B12 Deficiency	Yes	18	18.0%
	No	82	82.0%
	Total	100	100.0%

18% of postmenopausal women were found to have a deficiency in vitamin B12, while 82% did not have a deficiency.

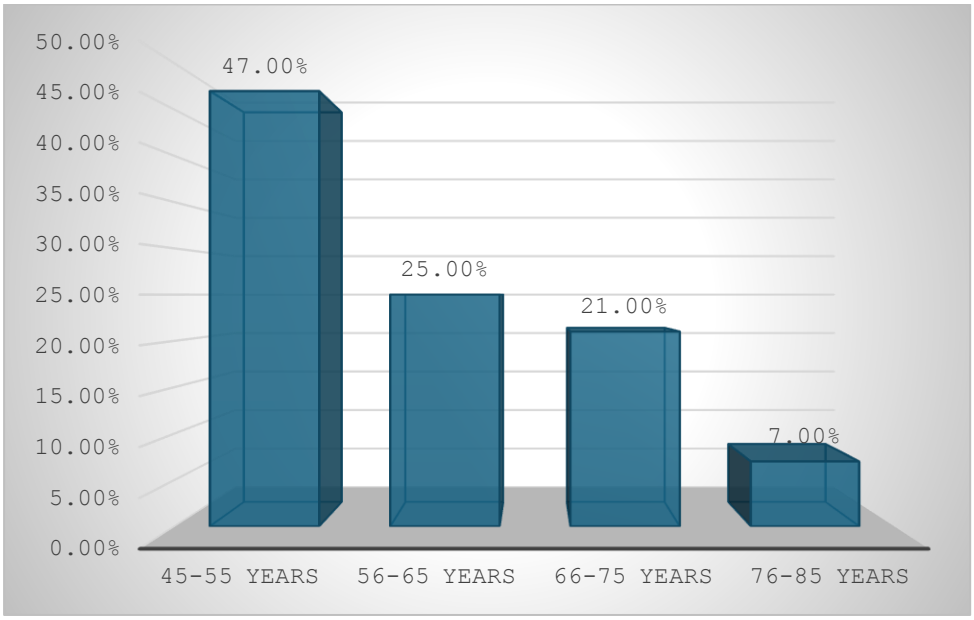


GRAPH 1: DISTRIBUTION OF PATIENTS BASED ON THE VITAMIN B12 DEFICIENCY

TABLE 2: DISTRIBUTION OF PATIENTS BASED ON THE AGE

		Frequency	Percent
Age Group	45-55 years	47	47.0%
	56-65 years	25	25.0%
	66-75 years	21	21.0%
	76-85 years	7	7.0%
	Total	100	100.0%

Nearly half of the patients fall within the 45-55 age group, comprising 47%. Following closely behind, individuals aged 56-65 represent 25%. Those aged 66-75 years constitute 21% and older age groups of 76-85 years were 7% of all patients.



GRAPH 2: DISTRIBUTION OF PATIENTS BASED ON THE AGE

TABLE 3: DISTRIBUTION OF PATIENTS BASED ON THE SENSORY AND MOTOR DEFICIT

	Frequency	Percent
Sensory deficit	24	24.0%
Motor deficit	17	17.0%
Sensory & Motor deficit	32	32.0%

Sensory deficit was present in 22%, motor deficit was present in 17% patients and Sensory & Motor deficit was present in 32%.

TABLE 4: DISTRIBUTION OF PATIENTS BASED ON THE GENERAL EXAMINATION FINDINGS

	Frequency	Percent
Pallor	14	14.0%
Icterus	0	0.0%
Edema	0	0.0%

Pallor was present in 14% patients.

TABLE 5: DISTRIBUTION OF PATIENTS BASED ON THE DIFFERENT MOTOR AND SENSORY CHARACTERISTICS

		Frequency	Percent
TOUCH	Normal	97	97.0%
	Abnormal	3	3.0%
PAIN	Normal	94	94.0%
	Exaggerated	6	6.0%
TEMP	Normal	97	97.0%
	Abnormal	3	3.0%
VIBRATION	Normal	93	93.0%
	Abnormal	7	7.0%
JOINT POSITION (UL/LL)	Normal	96	96.0%
	Abnormal	4	4.0%
	Normal	88	88.0%

TACTILE LOCALIZATION	Abnormal	12	12.0%
TACTILE DISCRIMINATION	Normal	92	92.0%
	Abnormal	8	8.0%
2 POINT DISCRIMINATION	Normal	87	87.0%
	Abnormal	13	13.0%
FIGURE WRITING	Normal	95	95.0%
	Abnormal	5	5.0%
CO-ORDINATION	Normal	97	97.0%
	Abnormal	3	3.0%
ATTITUDE	Normal	100	100.0%
BULK	Normal	100	100.0%
TONE	Normal	99	99.0%
	Abnormal	1	1.0%
POWER	Normal	93	93.0%
	Abnormal	7	7.0%
REFLEXES	Normal	91	91.0%
	Abnormal	9	9.0%
FASCICULATIONS	Yes	4	4.0%
	No	96	96.0%

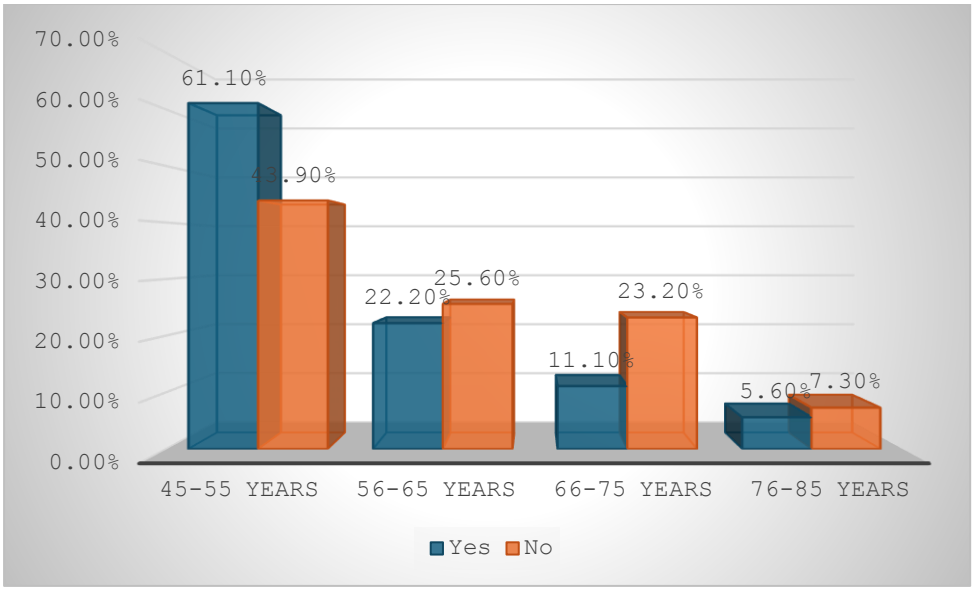
In terms of touch sensitivity, 97% patients had normal responses. While most report normal pain sensations, some experienced exaggerated pain, constituting 6%. Temperature perception appears mostly normal, with only 3% showing abnormalities. Similarly, vibration detection is mostly intact, although 7% display abnormal responses. Joint position sense

is intact in 96% of patients, with 4% showing abnormalities. Tactile localization, discrimination, and two-point discrimination are generally normal, although abnormalities are observed in 12%, 8%, and 13% of cases, respectively. Fine motor skills, coordination, and attitude towards tasks are predominantly normal. Muscle tone is mostly within normal limits, with only 1% exhibiting abnormalities. However, power and reflexes show abnormalities in 7% and 9% of patients, respectively. Lastly, fasciculations are present in 4% of cases, while the majority, 96%, do not exhibit them.

TABLE 6: VITAMIN B12 DEFICIENCY ACROSS DIFFERENT AGE GROUPS

			Vitamin B12 Deficiency		Total	P Value
			Yes	No		
Age Group	45-55 years	n	11	36	47	0.55
		%	61.1%	43.9%	47.0%	
	56-65 years	n	4	21	25	
		%	22.2%	25.6%	25.0%	
	66-75 years	n	2	19	21	
		%	11.1%	23.2%	21.0%	
	76-85 years	n	1	6	7	
		%	5.6%	7.3%	7.0%	
Total		n	18	82	100	
		%	100.0%	100.0%	100.0%	

Among patients with vitamin B12 deficiency, majority of the patients belonged to the age group of 45-55 years (61.1%). The association between them was found to be statistically not significant.



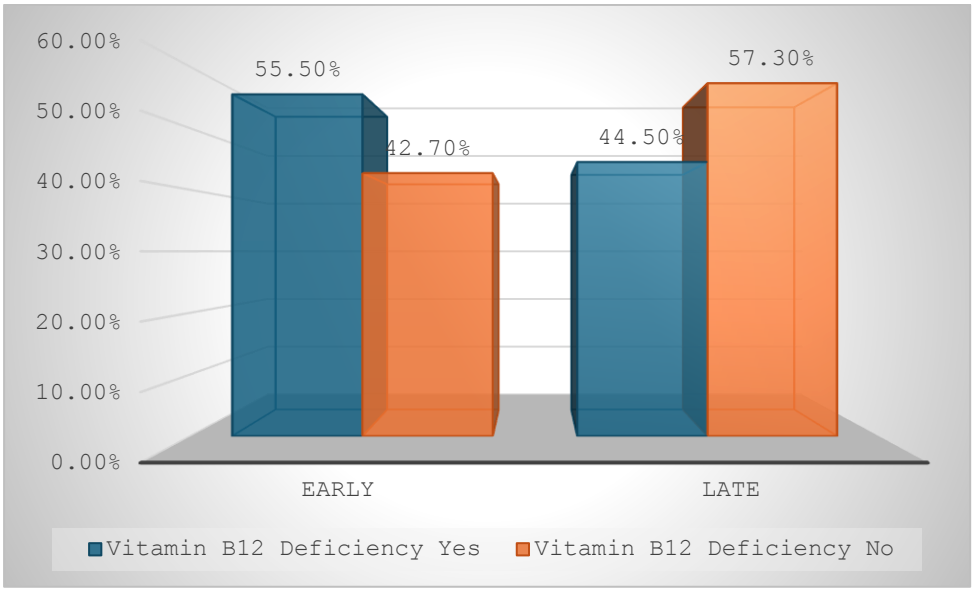
GRAPH 3: VITAMIN B12 DEFICIENCY ACROSS DIFFERENT AGE GROUPS

TABLE 7: CORRELATION OF VITAMIN B12 DEFICIENCY WITH AGE ACCORDING TO STRAW STAGING SYSTEM

			Vitamin B12 Deficiency		Total	P Value
			Yes	No		
STRAW STAGING system	Early	n	10	35	45	0.32
		%	55.5%	42.7%	45.0%	
	Late	n	8	47	55	
		%	44.5%	57.3%	55.0%	
Total		n	18	82	100	
		%	100.0%	100.0%	100.0%	

Among patients with vitamin B12 deficiency, 55.5% of patients with vitamin B12 deficiency were found in early straw staging and 44.5% of patients with vitamin B12 deficiency were found

in late straw staging. The association between them was found to be statistically not significant.



GRAPH 4: CORRELATION OF VITAMIN B12 DEFICIENCY WITH AGE ACCORDING TO STRAW STAGING SYSTEM

TABLE 8: DISTRIBUTION OF PATIENTS BASED ON SENSORY DEFICIT, MOTOR DEFICITS AND VITAMIN B12 DEFICIENCY

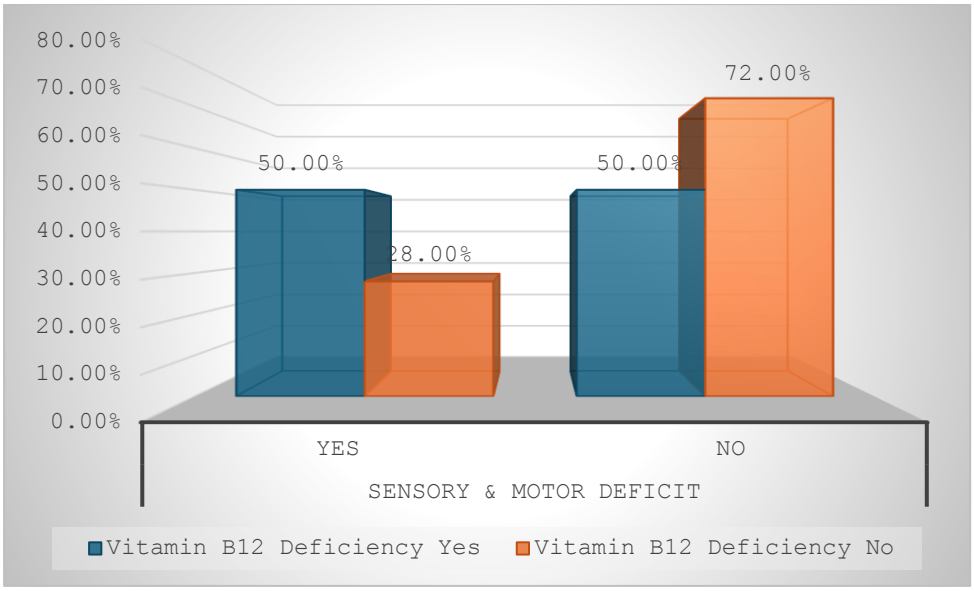
			Vitamin B12 Deficiency		Total	P Value
			Yes	No		
SENSORY DEFICIT	Yes	n	9	16	25	0.01
		%	52.9%	19.7%	25.5%	
	No	n	8	65	73	
		%	47.1%	80.3%	74.5%	
MOTOR DEFICIT	Yes	n	6	11	17	0.05
		%	33.3%	13.4%	17.0%	
	No	n	12	71	83	
		%	66.7%	86.6%	83.0%	

Among patients with vitamin B12 deficiency, sensory deficit was present in 52.9% patients and motor deficit was present in 33.3% patients. The association between them was found to be statistically significant.

TABLE 9: DISTRIBUTION OF PATIENTS BASED ON SENSORY & MOTOR DEFICITS WITH VITAMIN B12 DEFICIENCY

			Vitamin B12 Deficiency		Total	P Value
			Yes	No		
Sensory & Motor Deficit	Yes	n	9	23	32	0.05
		%	50.0%	28.0%	32.0%	
	No	n	9	59	68	
		%	50.0%	72.0%	68.0%	
Total		n	18	82	100	
		%	100.0%	100.0%	100.0%	

Among patients with vitamin B12 deficiency, sensory and motor deficit was present in 50% patients. The association between them was found to be statistically significant.



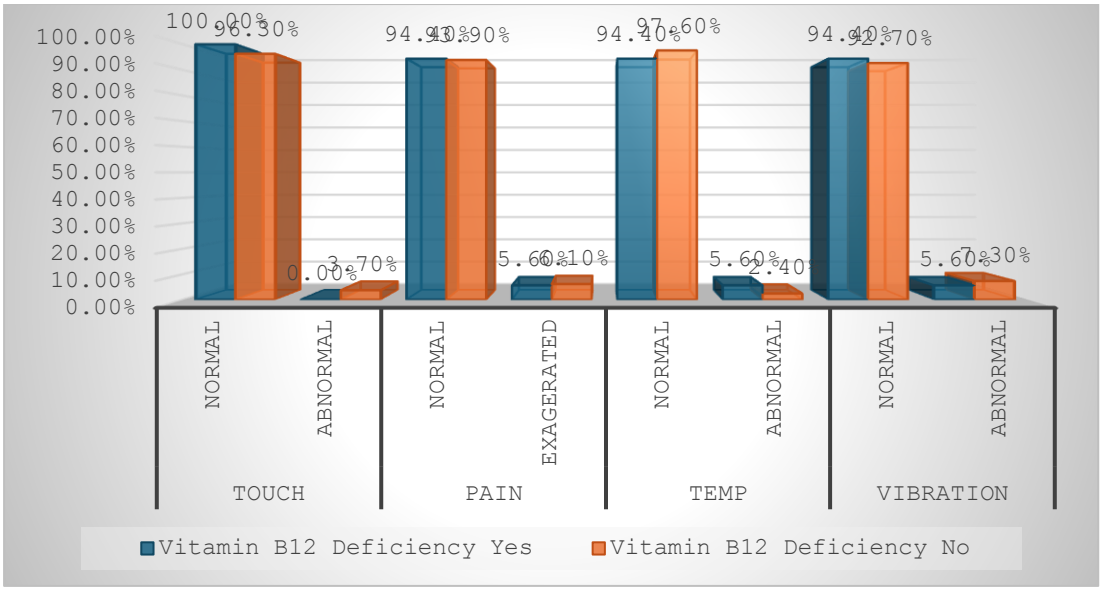
GRAPH 5: DISTRIBUTION OF PATIENTS BASED ON SENSORY & MOTOR DEFICITS WITH VITAMIN B12 DEFICIENCY

TABLE 10: DISTRIBUTION OF PATIENTS BASED ON RELATIONSHIP BETWEEN VITAMIN B12 DEFICIENCY AND SENSORY FUNCTIONS, SPECIFICALLY TOUCH, PAIN PERCEPTION, TEMPERATURE SENSATION, AND VIBRATION SENSE.

			Vitamin B12 Deficiency		Total	P Value
			Yes	No		
TOUCH	Normal	n	18	79	97	0.54
		%	100.0 %	96.3 %	97.0 %	
	Abnormal	n	0	3	3	
		%	0.0%	3.7%	3.0%	
PAIN	Normal	n	17	77	94	0.76
		%	94.4%	93.9 %	94.0 %	
	Exagerated	n	1	5	6	
		%	5.6%	6.1%	6.0%	
TEMP	Normal	n	17	80	97	0.45
		%	94.4%	97.6 %	97.0 %	
	Abnormal	n	1	2	3	
		%	5.6%	2.4%	3.0%	
VIBRATION	Normal	n	17	76	93	0.63
		%	94.4%	92.7 %	93.0 %	
	Abnormal	n	1	6	7	
		%	5.6%	7.3%	7.0%	

We examined the relationship between vitamin B12 deficiency and sensory functions, specifically touch, pain perception, temperature sensation, and vibration sense.

- For touch: 100% of patients with vitamin B12 deficiency had normal touch sensation. The association between them was found to be statistically not significant.
- For pain perception: 94.4% of patients with vitamin B12 deficiency had normal pain perception and 5.6% patients had exaggerated pain perception. The association between them was found to be statistically not significant.
- For temperature sensation: 94.4% of patients with vitamin B12 deficiency had normal temperature sensation and 5.6% patients had abnormal temperature sensation. The association between them was found to be statistically not significant.
- For vibration sense: 94.4% of patients with vitamin B12 deficiency had normal vibration sense and 5.6% patients had abnormal vibration sense. The association between them was found to be statistically not significant.



GRAPH 6: DISTRIBUTION OF PATIENTS BASED ON RELATIONSHIP BETWEEN VITAMIN B12 DEFICIENCY AND SENSORY FUNCTIONS, SPECIFICALLY TOUCH, PAIN PERCEPTION, TEMPERATURE SENSATION, AND VIBRATION SENSE.

TABLE 11: ASSOCIATION BETWEEN VITAMIN B12 DEFICIENCY AND VARIOUS SENSORY AND MOTOR FUNCTIONS, INCLUDING JOINT POSITION SENSE (UPPER LIMB/LOWER LIMB), TACTILE LOCALIZATION, TACTILE DISCRIMINATION, TWO-POINT DISCRIMINATION, FIGURE WRITING, AND COORDINATION.

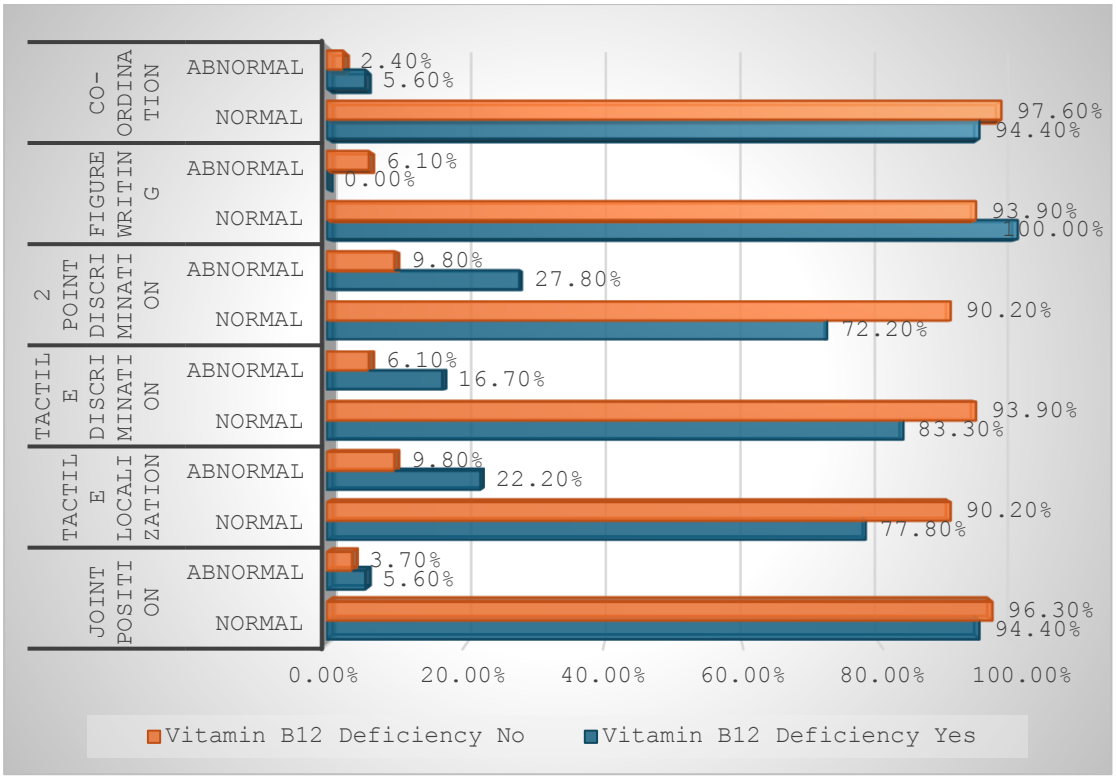
			Vitamin B12 Deficiency		Total	P Value
			Yes	No		
JOINT POSITION (UL/LL)	Normal	n	17	79	96	0.55
		%	94.4 %	96.3 %	96.0 %	
	Abnormal	n	1	3	4	
		%	5.6%	3.7 %	4.0 %	
TACTILE LOCALIZATION	Normal	n	14	74	88	0.14
		%	77.8 %	90.2 %	88.0 %	
	Abnormal	n	4	8	12	
		%	22.2 %	9.8 %	12.0 %	
TACTILE DISCRIMINATION	Normal	n	15	77	92	0.15
		%	83.3 %	93.9 %	92.0 %	
	Abnormal	n	3	5	8	
		%	16.7 %	6.1 %	8.0 %	
2 POINT DISCRIMINATION	Normal	n	13	74	87	0.05
		%	72.2 %	90.2 %	87.0 %	
	Abnormal	n	5	8	13	
		%	27.8 %	9.8 %	13.0 %	
	Normal	n	18	77	95	0.36

FIGURE WRITING		%	100.0 %	93.9 %	95.0 %	
	Abnormal	n	0	5	5	
		%	0.0%	6.1 %	5.0 %	
CO-ORDINATION	Normal	n	17	80	97	0.45
		%	94.4 %	97.6 %	97.0 %	
	Abnormal	n	1	2	3	
		%	5.6%	2.4 %	3.0 %	

- For joint position sense: 94.4% of patients with vitamin B12 deficiency had normal joint position sense and 5.6% patients had abnormal joint position sense. The association between them was found to be statistically not significant.
- For tactile localization: 77.8% of patients with vitamin B12 deficiency had normal tactile localization and 22.2% patients had abnormal tactile localization. The association between them was found to be statistically not significant.
- For tactile discrimination: 83.3% of patients with vitamin B12 deficiency had normal tactile discrimination and

16.7% patients had abnormal tactile discrimination. The association between them was found to be statistically not significant.

- For two-point discrimination: 72.2% of patients with vitamin B12 deficiency had normal two-point discrimination and 27.8% patients had abnormal two-point discrimination. The association between them was found to be statistically significant.
- For figure writing: 100% of patients with vitamin B12 deficiency had normal figure writing. The association between them was found to be statistically not significant.
- For coordination: 94.4% of patients with vitamin B12 deficiency had normal coordination and 5.6% patients had abnormal coordination. The association between them was found to be statistically not significant.



GRAPH 7: ASSOCIATION BETWEEN VITAMIN B12 DEFICIENCY AND VARIOUS SENSORY AND MOTOR FUNCTIONS, INCLUDING JOINT POSITION SENSE (UPPER LIMB/LOWER LIMB), TACTILE LOCALIZATION, TACTILE DISCRIMINATION, TWO-POINT DISCRIMINATION, FIGURE WRITING, AND COORDINATION.

			Vitamin B12 Deficiency		Total	P Value
			Yes	No		
ATTITUDE	Normal	n	18	82	100	-
		%	100.0%	100.0%	100.0%	
BULK	Normal	n	18	82	100	-
		%	100.0%	100.0%	100.0%	
TONE	Normal	n	17	82	99	0.18
		%	94.4%	100.0%	99.0%	
	Abnormal	n	1	0	1	
		%	5.6%	0.0%	1.0%	
POWER	Normal	n	16	77	93	0.36
		%	88.9%	93.9%	93.0%	
	Abnormal	n	2	5	7	
		%	11.1%	6.1%	7.0%	
REFLEXES	Normal	n	14	77	91	0.05
		%	77.8%	93.9%	91.0%	
	Abnormal	n	4	5	9	
		%	22.2%	6.1%	9.0%	
FASCICULATIONS	Yes	n	2	2	4	0.14
		%	11.1%	2.4%	4.0%	
	No	n	16	80	96	
		%	88.9%	97.6%	96.0%	

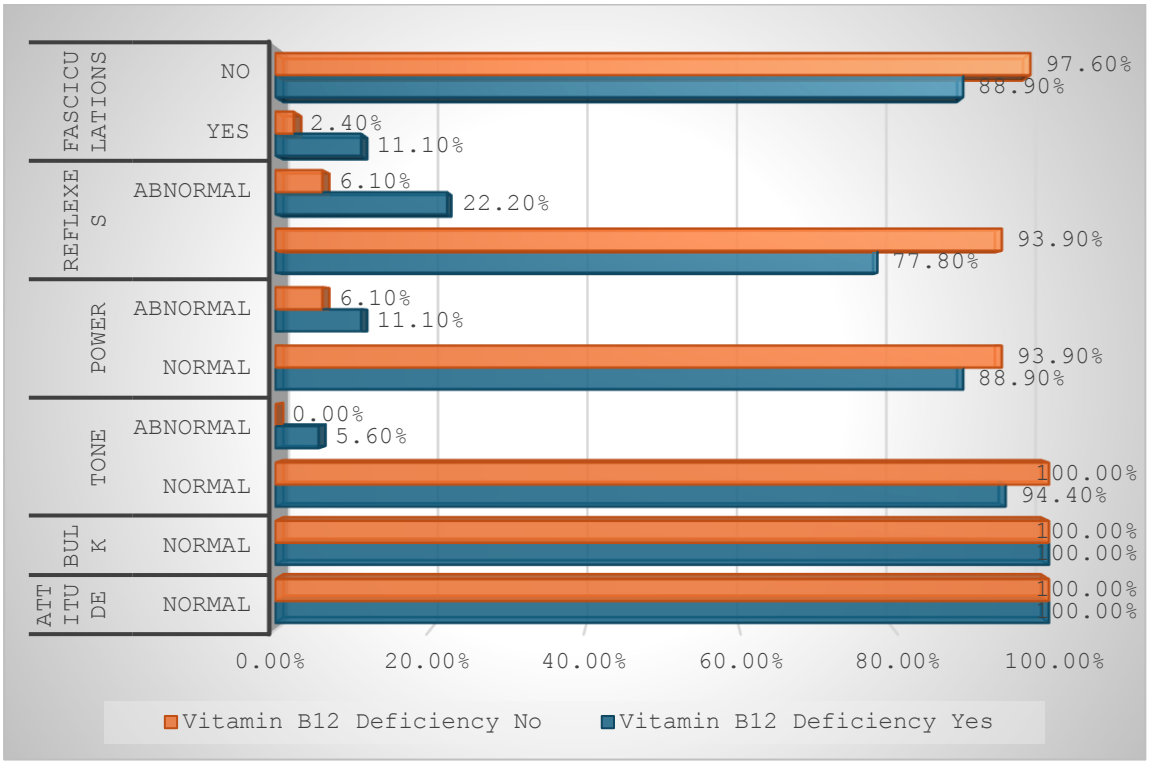
TABLE 12: RELATIONSHIP BETWEEN VITAMIN B12 DEFICIENCY AND VARIOUS NEUROLOGICAL PARAMETERS, INCLUDING ATTITUDE, BULK, TONE, POWER, REFLEXES, AND FASCICULATIONS.

Relationship between vitamin B12 deficiency and various neurological parameters, including attitude, bulk, tone, power, reflexes, and fasciculations.

- For attitude: 100% of patients with vitamin B12 deficiency had a normal attitude.

- For bulk: 100% of patients with vitamin B12 deficiency had normal bulk.
- For tone: 94.4% of patients with vitamin B12 deficiency had normal tone and 5.6% patients had abnormal tone. The association between them was found to be statistically not significant.
- For power: 88.9% of patients with vitamin B12 deficiency had normal power and 11.1% patients had abnormal power. The association between them was found to be statistically not significant.
- For reflexes: 77.8% of patients with vitamin B12 deficiency had normal reflexes and 22.2% patients had abnormal reflexes. The association between them was found to be statistically significant.
- For fasciculations: 11.1% of patients with vitamin B12 deficiency had fasciculations and 88.9% patients had

abnormal fasciculations. The association between them was found to be statistically not significant.



GRAPH 8: RELATIONSHIP BETWEEN VITAMIN B12 DEFICIENCY AND VARIOUS NEUROLOGICAL PARAMETERS, INCLUDING ATTITUDE, BULK, TONE, POWER, REFLEXES, AND FASCICULATIONS.

DISCUSSION

VITAMIN B12 DEFICIENCY

In this study, 18% of postmenopausal women were found to have a deficiency in vitamin B12, while 82% did not have a deficiency.

A study conducted by Dhonukshe-Rutten et al.[22] reported prevalence rates ranging from 5% to 50% among postmenopausal women in different regions. Similarly, data from the National Health and Nutrition Examination Survey in the United States showed that approximately 6% of women aged 50 years and older had vitamin B12 deficiency.[23]

AGE GROUP

In this study, Nearly half of the patients fall within the 45-55 age group, comprising 47%. Following closely behind, individuals aged 56-65 represent 25%. Those aged 66-75 years constitute 21% and older age groups of 76-85 years were 7% of all patients. Among patients with vitamin B12 deficiency, majority of the patients belonged to the age

group of 45-55 years (61.1%). The association between them was found to be statistically not significant.

SENSORY AND MOTOR DEFICIT

In this study, Sensory deficit was present in 22%, motor deficit was present in 17% patients and Sensory & Motor deficit was present in 32%. Among patients with vitamin B12 deficiency, sensory deficit was present in 52.9% patients and motor deficit was present in 33.3% patients. The association between them was found to be statistically significant. Among patients with vitamin B12 deficiency, sensory and motor deficit was present in 50% patients. The association between them was found to be statistically significant.

Sensory and motor deficits are prevalent among postmenopausal women, with studies highlighting a range of manifestations including peripheral neuropathy, balance disturbances, and muscle weakness. A study by Leveille et al.[24] found that approximately 20% of postmenopausal women reported difficulty with balance or walking, while a systematic review by Wesson-Sides et al. [25] reported a high prevalence of peripheral neuropathy symptoms among older adults, including postmenopausal women.

Several factors contribute to the development of sensory and motor deficits in postmenopausal women, including age-related changes in neuromuscular function, hormonal fluctuations, and comorbidities such as diabetes mellitus and peripheral vascular disease. Additionally, emerging evidence suggests that vitamin B12 deficiency may play a role in the pathogenesis of sensory and motor deficits due to its essential role in nerve function and myelination[26].

Vitamin B12 deficiency has been implicated in the development and progression of sensory and motor deficits among postmenopausal women. Studies have shown that vitamin B12 deficiency is associated with peripheral neuropathy, characterized by sensory symptoms such as numbness, tingling, and pain in the extremities, as well as motor symptoms including muscle weakness and impaired balance[26,27]. Furthermore, vitamin B12 supplementation has been shown to improve neurological symptoms and functional outcomes in individuals with deficiency[28].

STRAW STAGING SYSTEM

We should consider both the STRAW staging system and vitamin B12 deficiency when assessing the health status of postmenopausal women.

In this study, Among patients with vitamin B12 deficiency, 55.5% of patients with vitamin B12 deficiency were found in early straw staging and 44.5% of patients with vitamin B12 deficiency were found in late straw staging. The association between them was found to be statistically not significant.

The STRAW staging system and vitamin B12 deficiency are important considerations in understanding the health status of postmenopausal women. While the STRAW staging system provides a framework for characterizing reproductive aging, vitamin B12 deficiency represents a nutritional concern with implications for sensory and motor function.

TOUCH

In this study, 100% of patients with vitamin B12 deficiency had normal touch sensation. The association between them was found to be statistically not significant. Studies have reported a significant association between vitamin B12 deficiency and impaired touch sensation[29], others have found no such association[30]. Tuncel et al.[29] conducted a study examining the neurological manifestations of vitamin B12 deficiency in older adults and found that a significant proportion of patients with deficiency exhibited impaired touch

sensation, suggesting a potential link between vitamin B12 status and tactile perception. Conversely, Allen et al. [30] investigated the clinical spectrum of cobalamin deficiency and found that touch sensation was relatively preserved in most individuals with deficiency, particularly in the absence of severe neurological complications. This finding suggests that other sensory modalities may be more affected by vitamin B12 deficiency than touch sensation.

PAIN PERCEPTION

In this study, 94.4% of patients with vitamin B12 deficiency had normal pain perception and 5.6% patients had exaggerated pain perception. The association between them was found to be statistically not significant. Gröber et al.[31] conducted a review highlighting the role of vitamin B12 in pain treatment and neuropathic pain management. The review discussed the mechanisms by which vitamin B12 deficiency may contribute to altered pain perception, including neuronal damage, neurotransmitter imbalances, and impaired nerve regeneration. Chang et al. [32] evaluated the clinical efficacy of methylcobalamin, an active form of vitamin B12, in the treatment of diabetic neuropathy-related pain. The study found that

methylcobalamin supplementation was effective in alleviating neuropathic pain and improving pain thresholds in individuals with vitamin B12 deficiency.

TEMPERATURE SENSATION

In this study, 94.4% of patients with vitamin B12 deficiency had normal temperature sensation and 5.6% patients had abnormal temperature sensation. The association between them was found to be statistically not significant. Rosenstock et al[33] conducted a study examining the neurological manifestations of vitamin B12 deficiency and found that impaired temperature sensation was a common clinical feature among individuals with deficiency. The study suggested that vitamin B12 deficiency may disrupt sensory nerve function, leading to abnormalities in temperature perception. Conversely, Kalezic et al[34] investigated the relationship between vitamin B12 deficiency and bone mineral density but found no significant association with temperature sensation. This finding suggests that other factors may contribute to alterations in temperature sensation independently of vitamin B12 status.

VIBRATION SENSE

In this study, 94.4% of patients with vitamin B12 deficiency had normal vibration sense and 5.6% patients had abnormal vibration sense. The association between them was found to be statistically not significant. A study by Lindenbaum et al[35] found that vitamin B12 deficiency led to neurological symptoms in nearly two-thirds of the patients, with diminished vibration sense being one of the most common manifestations. This study highlighted the importance of considering vitamin B12 deficiency in the evaluation of sensory-motor deficits, especially in older adults. Furthermore, another study by Scalabrino et al[36] investigated the effects of vitamin B12 deficiency on the peripheral nervous system and found that impaired vibration sense was one of the earliest detectable signs of neurological damage in patients with low serum B12 levels. A meta-analysis conducted by Oosterhuis et al[37] examined the relationship between vitamin B12 deficiency and neurological manifestations, including sensory abnormalities. The analysis concluded that vitamin B12 deficiency was significantly associated with sensory impairments, such as diminished vibration sense, highlighting the importance of adequate B12 levels for maintaining sensory-motor function.

JOINT POSITION SENSE

In this study, 94.4% of patients with vitamin B12 deficiency had normal joint position sense and 5.6% patients had abnormal joint position sense. The association between them was found to be statistically not significant. A study by Filla et al.[38] examined the neurological manifestations of vitamin B12 deficiency and found that impaired proprioception was a common neurological finding in patients with low serum B12 levels. Aroda et al. [39] evaluated the relationship between vitamin B12 levels and proprioception over time in a cohort of postmenopausal women. The study found that lower serum B12 levels were significantly associated with poorer proprioceptive function, as assessed by joint position sense tests.

TACTILE LOCALIZATION

In this study, 77.8% of patients with vitamin B12 deficiency had normal tactile localization and 22.2% patients had abnormal tactile localization. The association between them was found to be statistically not significant. A study by Agarwal et al.[40] assessed sensory abnormalities in patients with vitamin B12 deficiency and found that impaired tactile sensation was a common neurological finding. While

this study did not specifically focus on tactile localization, it suggests that B12 deficiency can indeed affect various aspects of sensory function. van der Elst et al. [41] investigated the relationship between vitamin B12 levels and cognitive function, including tactile perception, in older adults.

TACTILE & TWO-POINT DISCRIMINATION

In this study, 83.3% of patients with vitamin B12 deficiency had normal tactile discrimination and 16.7% patients had abnormal tactile discrimination. The association between them was found to be statistically not significant. 72.2% of patients with vitamin B12 deficiency had normal two-point discrimination and 27.8% patients had abnormal two-point discrimination. The association between them was found to be statistically significant.

FIGURE WRITING

In this study, 100% of patients with vitamin B12 deficiency had normal figure writing. The association between them was found to be statistically not significant.

COORDINATION

In this study, 94.4% of patients with vitamin B12 deficiency had normal coordination and 5.6% patients had abnormal coordination. The association between them was found to be statistically not significant. Lindenbaum et al.[35] examined neuropsychiatric disorders caused by cobalamin deficiency and found that impaired coordination and balance were common clinical findings in patients with low serum B12 levels. Penninx et al. [42] investigated the association between vitamin B12 levels and physical performance in older adults and found that lower B12 levels were associated with poorer performance on measures of balance and coordination.

RELATIONSHIP BETWEEN VITAMIN B12 DEFICIENCY AND VARIOUS NEUROLOGICAL PARAMETERS, INCLUDING ATTITUDE, BULK, TONE, POWER, REFLEXES, AND FASCICULATIONS.

- For attitude: 100% of patients with vitamin B12 deficiency had a normal attitude.

- For bulk: 100% of patients with vitamin B12 deficiency had normal bulk.
- For tone: 94.4% of patients with vitamin B12 deficiency had normal tone and 5.6% patients had abnormal tone. The association between them was found to be statistically not significant.
- For power: 88.9% of patients with vitamin B12 deficiency had normal power and 11.1% patients had abnormal power. The association between them was found to be statistically not significant.
- For reflexes: 77.8% of patients with vitamin B12 deficiency had normal reflexes and 22.2% patients had abnormal reflexes. The association between them was found to be statistically significant.
- For fasciculations: 11.1% of patients with vitamin B12 deficiency had fasciculations and 88.9% patients had abnormal fasciculations. The association between them was found to be statistically not significant.

The study's primary limitation pertains to the scope of data collection. The research may have been conducted within a specific time frame,

geographic location, or demographic group, which could limit the generalizability of the findings to a broader population.

Another potential limitation is that a small or non-diverse sample might lead to biased or limited conclusions, impacting the study's validity.

The study's methodology may have its limitations, such as the use of self-reported data, potential researcher bias, or methodological design flaws, which could introduce errors

Overall, these limitations should be carefully considered when interpreting the study's results and should motivate future research to address these constraints for a more comprehensive understanding

SUMMARY

- 18% of postmenopausal women were found to have a deficiency in vitamin B12, while 82% did not have a deficiency.
- Sensory deficit was present in 22%, motor deficit was present in 17% patients and Sensory & Motor deficit was present in 32%. Among patients with vitamin B12 deficiency, sensory deficit was present in 52.9% patients and motor deficit was present in 33.3% patients & sensory + motor deficit was present in 50% patients.
- 100% of patients with vitamin B12 deficiency had normal touch sensation, 94.4% of patients with vitamin B12 deficiency had normal pain perception and 5.6% patients had exaggerated pain perception, 94.4% of patients with vitamin B12 deficiency had normal temperature sensation and 5.6% patients had abnormal temperature sensation, 94.4% of patients with vitamin B12 deficiency had normal vibration sense and 5.6% patients had abnormal vibration sense, 94.4% of patients with vitamin B12 deficiency had normal joint position sense and 5.6% patients had abnormal joint position sense, 77.8% of patients with vitamin B12 deficiency had normal tactile localization and 22.2% patients

had abnormal tactile localization, 94.4% of patients with vitamin B12 deficiency had normal coordination and 5.6% patients had abnormal coordination.

CONCLUSION

In this study, we conclude that the association of sensory and motor deficits with Vitamin B12 deficiency was found to be statistically significant. The prevalance of vitamin B 12 deficiency in post menopausal women is 18%.

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Annexure-I

INFORMED CONSENT FORM

"CORRELATION OF VITAMIN B12 DEFICIENCY WITH SENSORYMOTOR DEFICITS IN POST MENAPAUSAL WOMEN

Name of Student/Principal Investigator:
Name of Guide/Co Investigators:

Objective: : To determine the correlation of vit B12 deficiency with sensorymotor deficit in post menopausal women.

Introduction: Post menopausal women are predisposed to many physiological changed due to the harmonal fluctuations. The deficiency of Vitamin B12 causes symptoms which overlap with that of menopausal syndrome. This study will help us determine the prevelance of such women with cost effective OPD based investigations and clinical examination. This study will help in initiating the right treatment based on the etiology.

Explanation of procedure: : 3.5 ml venous blood will be taken from post menapausal woman coming to KLEH

OPD in a plain vacutainer and 2ml in EDTA vacutainer with their consent and they will be subjected to clinical examination

Withdrawal from participation in the study: Participation in this study is voluntary. You will be free to decide whether to participate in this study or continue participation once enrolled. In case you decide to withdraw your participation, you are free to do so. However, please convey the decision to the principal investigator.

Possible benefits from participating in the study: You will/will not have nor get any benefits by participating in this study. The data gathered will help the population at large.

Possible risks from participating in the study: There are no risks involved in participating in this study.

Privacy and confidentiality: The information collected from you will be coded, to prevent any person from identifying you. Your identity will never be revealed. The data collected from you will be kept confidential and

only processed or aggregated data will be used for publication.

Financial incentives: You will not receive any payment for participating in this study.

Authorization for publication of aggregated data: Results obtained after processing of the aggregated data will be published for scientific purposes and or presented to scientific groups. However, your identity will never be revealed.

Questions: In case of any questions with regard to this study, you are free to contact: "Name of student/PI, mobile number, email ID" If you have any question or complaints with regard to your right as study participant you may contact Dr Harsha Hegde, Chairperson, Ethical committee of JNMC, 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 "**CORRELATION OF VITAMIN B12 DEFICIENCY WITH SENSORYMOTOR DEFICITS IN POST MENAPAUSAL WOMEN "**
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 in the language that I understand best. I was given the opportunity to ask questions and that they have been answered to my satisfaction.

Name of the participant:

Signature or left thumb impression of the participant:

Name of the witness:

Signature or left thumb impression of the witness:

Name of the investigator:

Signature of the investigator:

SCREENING FORM

SCREENING NUMBER-

NAME	
OP NUMBER	
HUSBANDS NAME	
AGE	
SEX	
ADDRESS- HOUSE NO STREET TALUK DISTRICT RURAL/URBAN.	
PHONE NUMBER- 1- 2-	
SOCIOECONOMIC STATUS (AS PER BG PRASAD SCORE)	
LEVEL OF EDUCATION	
DATE OF VISIT TO OPD	
PRESENTING COMPLAINTS WITH DURATION	
PROVISIONAL DIAGNOSIS	
FINAL DIAGNOSIS	

PAST HISTORY	YES	NO
ORTHOPEDIC SURGERIES		
STROKE		
PARALYSIS		
THALLESEMIA		
DIABETES		
HYPERTENSION		

ELIGIBLE -YES/NO
CONSENT GIVEN-YES/NO

Annexure-II

PROFORMA

TEST	VALUES(pmol/L)
VITAMIN B12	

YEARS SINCE MENAPAUSE	
GENERAL EXAMINATION	
PULSE RATE	
BLOOD PRESSURE	
RESPIRATORY RATE	
JOINT DEFORMITY	
PALLOR	
ICTERUS	
EDEMA	

SENSORY- MOTOR EXAMINATION

RESPONSE	SYMBOL
NORMAL	□
ABNORMAL	×

ABSENT	O
PRESENT	+
EXAGGERATED	++
MARKEDLY EXAGGERATED	+++
RIGHT	(R)
LEFT	(L)

SENSORY EXAMINATION

TOUCH	
PAIN	
TEMPERATURE	
VIBRATION	
JOINT POSITION UPPER LIMB LOWER LIMB	
LIMB POSITION	
CORTICAL SENSATION TACTILE LOCALIZATION- TACTILE DISCRIMINATION- 2 POINT DISCRIMINATION- FIGURE WRITING-	
CO-ORDINATION	
CEREBELLAR SIGNS GAIT PRONATOR DRIFT FINGER TO NOSE TEST RAPID ALTERNATING ACTION HEEL TO SHIN TEST	

MOTOR EXAMINATION

SYMMETRY				
BULK				
TONE				
FASCICULATIONS WASTING				
POWER	NECK TRUNK			
			RIGHT	**LEFT**

	UPPER LIMB-	SHOULDER- FLEXOR EXTENSOR ABDUCTOR ADDUCTOR ELBOW- FLEXOR EXTENSOR WRIST- FLEXOR EXTENSOR		
	LOWER LIMB	HAND GRIP- PINCER OPPONENT HIP- FLEXOR EXTENSOR ABDUCTOR		

		ADDUCTOR KNEE- FLEXOR EXTENSOR ANKLE- DORSI FLEXORS PLANTAR FLEXORS INVERSION EVERSION		
REFLEXES	UPPER LIMB- LOWER LIMBS-	BICEPS TRICEPS SUPINATORS QUADRICEPS TENDOACHILLIS PLANTAR		

Annexure-III

MASTER CHART

S. NO	NAME	AGE	Only for mumPHONE NO	PRESENTING COMPLAINT	SIGNIFICANT PAST HISTHB LEVELS	VITAMIN B12 LEVELS	SENSORY DEFICIMOTOR DEFICITGEARS SINCEBLOOD PRESSUPULSE RATERESP RATEPALLOR	ICTERUSEDEMATOUCH PAIN	TEMPERATUREVIBRATION	JOINT POSITION	ULTACTILE LOCALIZATACTILE DISCRIMINAPOINT DISCRIMINAFIGURE WRITTECOGNIZINGATTITUDEBULK	TONE	FASCICULATIOPOWERREFLEXES
1	MRS ROSHABEE SADIQ	54	6966364	9733027691/9404423 with pain abdomen with subserosal none	12.2	197 NO	NO 3.1 40/88	86 16 no no no	N N	N	N	N	N N N N	NO	N N
2	MRS YALLU MALLAPPA GAVADE	50	11736809	8970738199/P3 A with b/l tingling	11.1	188 NO	NO 4.1 40/90	78 16 no no no	N N	N	N	N	N N N N	NO	N N
3	MRS PARAVVA SATEPPA SANADI	60	7995089	9440473052/P3 D with pain abdomen	none	12.8	128 YES	YES 2.6 150/92	86 18 no no no	N ABN	ABN	ABN	N/A	N N N N	YES	N ABN
4	MRS UMA NIJAGUNI PARWATAMAT	57	11735531	9740670625/P3 D with aav protepye	none	10.4	323 NO	NO 7.1 30/84	74 16 no no no	N N	N	N		N N N N	NO	N N
5	MRS MALLAVVA BHIMAPPA	75	17888696	8747786693 Backpain for evaluation	none	12.4	133 YES	YES 2.5 130/90	60 16 yes no no	N ABN	N	N	ABN	ABN N N N	NO	ABN N
6	MRS JANAKI MALOT	61	11542145	9965689657/P4 A with UV protepse	none	10.3	200 NO	NO 3.5 144/96	90 18 no no no	N N	N	N	N	N N N N	NO	N N
7	MRS DILSHAD ABDULKAREEM	50	11765644	9632183378/P4 A with low back pain	none	11.6	200 NO	NO 6.6 130/80	82 16 yes no no	N N	N	N	N	N N N N	NO	N N
8	MRS SHOBHA ARJUN KORI	53	6973375	9011374101/P4 A with UV protepse	none	10.7	168 NO	NO 2.1 24/86	90 18 no no no	N N	N	NN	N	N N N N	NO	N N
9	MRS HALEEMAN SUSHILA SHANKAR	60	6566605	8114256252/P3 A 24 L with excessive fatigue	none	12.2	388 NO	NO 7.1 38/90	90 14 no no no	N N	N	N	N	N N N N	NO	N N
10	MRS SADAVVAR SINDHU JAICOBA	57	6866824	9642413321/P2 L with UV protepse	none	11	200 NO	NO 5.1 28/86	92 18 no no no	N N	N	N	N	N N N N	NO	N N
11	MRS SULEBHAVANKAR AYAAZBHAI	66	6812364	7342267018/P2 A with tingling sensation	none	11.9	883 NO	NO 10.1 36/92	90 18 no no no	N N	N	N	N	N N N N	NO	N N
12	MRS RUDRAVVA EHARAMPPA NAVI	53	12023284	9731536452/C/O easy fatigability and weakness	none	4.2	240 YES	YES 8.1 36/80	122 18 yes no no	N EXAGERATEN	N	N	N	N N N N	NO	N ABN
13	MRS SAROJINI VALLAKARJUN HIREM	66	6807357	9148393639/P1 L with post menapausal spotting	VITAMIN B12 DEFICIENCY	13	222 YES	YES 5.1 90/60	92 19 no no no	N N	N	ABN	ABN	N N N N	NO	N ABN
14	MRS THAKKAR BAVAVVA CHINNAPP	78	7118816	9979078788/P2 A with excessive vomiting	none	12.9	1888 YES	NO 20.1 46/90	90 19 no no no	N N	N	ABN	ABN	N/A N/A N N	NO	N N
15	MRS DINDUR LAKSHMI MARULSIDDH	59	12000019	9972168801/P3 A with aav protepye and burning micturi none		8.8	103 NO	NO 1.4 130/90	92 18	no no no	N N	N	N	N N N N	NO	N N
16	MRS GEETHA ANIL KAKATI	46	4946131	8772394448/P Platinum health checkup	none	13.2	1510 NO	NO 1.1 10/68	84 16 no no no	N N	N	N	N	N N N N	NO	N N
17	MRS ANITA ANANTRAO JADHAV	67	7126575	8997683794/P2 D with fatigue	none	12.2	559 NO	NO 14.1 28/76	99 18 no no no	N N	N	N	N	N N N N	NO	N N
18	MRS BELGUND ARATI PREMNATH	48	7127752	9019846697/P2 A with fatigue	none	8.4	160 YES	NO 3.1 10/70	76 16 yes no no	N N	N	AbN	N	N N N N	NO	N N
19	MRS HONAGOUDAR TAYAVVA BALA	70	7179041	9482707784/P2 A with fatigue	none	10.5	350 NO	NO 2.6 110/70	87 16 no no no	N N	N	N	N	N N N N	NO	N N
20	MRS SUGALADA YAMANAPPA SIDN	80	4993820	9591945825/P2 D with mass per vagitum	none	12.5	2000 YES	NO 2.6 130/84	99 16 no no no	EXAGERATEN N	N	ABN	N	N N N N	NO	N N
21	MRS ANNAPURNA SAHADEV PATTA	45	7185023	9741364507/P1 L 42 with mass per abdomen	none	8.5	140 NO	YES 2.1 28/86	88 22 no no no	N N	N	N	N	N N N N	NO	N ABN
22	MRS SUGANDA SHANKAR CHAUGUL	70	7023258	9164109330/P2 L with UV protepse	MVN repair	9.1	2000 NO	NO 9.1 30/74	89 18 no no no	N N	N	N	N	N N N N	NO	N N
23	MRS SUGANDHA GOPAL HAMPANN	48	7188942	9731281126/P2 A with fatigue	none	11.6	2000 NO	NO 4.1 24/86	88 20 no no no	N N	N	N	N	N N N N	NO	N N
24	MRS GANGAVVA YALLAPPAH JAM	60	7190305	7899877806/P2 A with white discahrge PV	none	11	2000 NO	NO 3.0 137/87	76 20 no no no	N N	N	N	N	N N N N	NO	N N
25	MRS KALAVA LAKKAPPA ANKALAG	69	7190596	9652198722/P2 A with uv protepse	HbsAG positive	11.5	1067 YES	NO 19.1 50/96	98 16 no no no	EXAGERATEN N	N	AbN	AbN	N N N N	NO	N N
26	MRS SUREKHA PANDURANG PATIL	53	4918270	9890729170/P2 A with pain abdomen	none	13.9	100 NO	YES 9.1 30/74	86 22 no no no	N N	N	N	N	N N N N	NO	AbN N
27	MRS ANITA AMRUT DESH	53	5921575	9421325364/P1 D with pain abdomen	none	13.1	2000 NO	NO 3.1 24/78	78 16 no no no	N N	N	N	N	N N N N	NO	N N
28	MRS SAHEBI RAJAK SHAIK	70	7139825	9480432726/P2 A with tingling sensation	none	10	132 YES	YES 18.1 24/86	87 22 no no Abn	N N	N	N	N	N N N N	YES	N N
29	MRS MAHADEVI SUNIL SAVAGAVI	48	10029203	8880783942/P2 A with mass per vagitum	none	13.9	397 NO	NO 4.1 24/89	76 16 no no no	N N	N	N	N	N N N N	NO	N N
30	MRS AISHWARYA BHARATT TALAWA	65	6330534	7996744078/P3 A with aav protepye and burning micturi none		12.7	650 NO	NO 13.1 30/74	74 20 no no no	N N	N	N	N	N N N N	NO	N N
31	MRS LAMBANI BHAPPA KAMBAR	80	7209237	9353114741/P1 L 42 with mass per abdomen	none	10.2	400 NO	NO 18.1 30/80	80 20 no no no	N N	N	N	N	N N N N	NO	N N
32	MRS JAYAVANTI KAMBLE	53	7207192	8055201535/P3 D with headache	none	11.1	2000 NO	NO 13.1 10/70	98 20 no no no	N N	N	N	N	N N N N	NO	N N
33	MRS FATIMA WAJOD D SOUZA	73	7217654	9738362498/P2 A with tingling sensation	hypothyroidism	8.4	2000 NO	YES 26.1 30/74	98 18 yes no no	N N	N	N	N	N N N N	NO	ABN N
34	MRS BOMMANAGOWDA M NANGA	66	7212305	9741498330/P1 L 42 with mass per abdomen	none	9.4	2000 NO	NO 25.1 50/92	88 22 no no no	N N	N	N	N	N N N N	NO	N N
35	MRS MALU YALLAPPA KHANNUNAR	56	7212046	9738479456/P1 L with post menapausal spotting	none	12.7	192 NO	NO 2.1 24/86	93 18 no no no	N N	N	N	N	N N N N	NO	N N
36	MRS GUNDAN HASNALKH POSHI	69	7218831	9886142124/P1 L with post menapausal spotting	none	12.6	922 NO	NO 22.1 24/86	90 18 no no no	N N	N	N	N	N N N N	NO	N N
37	MRS ROOPADEVI MANJUNATH HIRE	57	7122945	7349373212/headache	none	11.7	295 NO	NO 1.1 10/70	87 22 no no no	N N	N	N	N	N N N N	NO	N N
38	MRS SUSHILA AMRUTI MISTRI	65	7122711	9890194830/headache	none	11.9	235 YES	NO 22.1 50/100	90 22 no no no	AbN N	N	N	N	N N N N	NO	N N
39	MRS KASHAVVA KADAPPA ANGADI	64	7122301	9591433184/P2 A with mass per abdomen	HbsAG positive	11.5	440 YES	NO 10.1 30/80	98 18 no no no	N N	N	ABN	ABN	N N N N	NO	N N
40	MRS UJJAVATI YIRUPAKSH BADIGER	77	5753444	8772398055/P3 D with UV protepse	none	9.8	430 NO	NO 24.1 28/76	78 20 no no no	N N	N	N	N	N N N N	NO	N N
41	MRS ANITA MALLIKARJUN WANKHA	49	7237651	9440959064/P2 A with epigastric pain	none	15.3	393 NO	NO 2.1 30/80	67 20 no no no	N N	N	N	N	N N N N	NO	N N
42	MRS SUNITA DHONDUSA PAWAR	76	7232846	9964070777/P2 A with epigastric pain	none	12.1	2000 NO	NO 22.1 28/76	78 16 no no no	N N	N	N	N	N N N N	NO	N N
43	MRS SUNANDA IRBAPA HINDALGEK	58	7244192	9964388025/P3 A with headache	TB	9.2	1006 NO	NO 18.1 52/90	88 20 yes no no	N N	N	N	N	N N N N	NO	N N
44	MRS SULOCHANA KESHAVRAO SUTR	76	10083380	9890789667/P2 D with loose stools	none	12.9	100 YES	NO 21.1 44/96	98 20 no no Abn	N N	N	N	/	N N N N	NO	N N
45	MRS VIJAYA YAMANAPPA DESHPANI	66	7242918	9440893878/P3 A 24 L with excessive fatigue	controlled HTN	8.6	2000 YES	YES 17.1 10/70	98 16 yes no no	N ABN	N	ABN	ABN	N N N N	YES	N N
46	MRS NEELAVVA BASAVARAJ HOVAL	46	7251931	9482787394/P1 L 42 with mass per abdomen	none	9.5	2000 NO	YES 1.1 24/78	78 16 no no no	N N	N	N	N	N N N N	YES	ABN N
47	MRS TULASABAI LAXMAN MANG	61	6931579	9449465218/P2 A with headache	controlled HTN	12.7	1514 NO	NO 11.1 50/92	L 20 no no no	N N	N	N	N	N N N N	NO	N N
48	MRS SHOBHA SIDDAPA ANAGALLI	62	7267121	9901738802/P2 A with aav protepye	none	9.6	244 NO	NO 14.1 24/86	88 18 no no no	N N	N	N	N	N N N N	NO	N N
49	MRS BALANGANAMM OMANNA DAN	72	7273636	8088778769/P3 A with back pain and shoulder pain	none	11.2	2000 NO	NO 28.1 52/96	98 18 YES no no	N N	N	N	N	N N N N	NO	N N
50	MRS RABECCA SADANAND MANI	56	3697985	6356807212/P1 D with pain abdomen	none	9.7	339 NO	NO 16.1 24/86	89 17 no no no	N N	N	N	N	N N N N	NO	N N

51	MRS SHASHIKALA ARUN YALIGAR	49	7279519	9035252585	EXECUTIVE CHECK UP	none	15.1	262	NO	NO	3	124/78	68	16	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
52	MRS DADDOYYA SHIDALING KESTI	68	7285881	7889894218	P4L3D1 with pain abdomen	none	9.4	2000	NO	NO	19	146/102	98	18	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
53	MRS VASUDHA NARAYAN PATIL	46	7287491	7337659888	P3L3 with headache	none	9	261	NO	NO	3	130/74	90	20	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
54	MRS SUMITRA NINGAPPA KUBANUR	55	3778589	9481432752	P3L3 with b/l tingling	asthma		1209	NO	YES	4	130/74	98	24	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	ABN
55	MRS LOHAR SULOCHANA GOPAL	62	7167695	9880506956	P1L1 with post menapausal spotting	none	12.9	821	NO	NO	14	110/75	90	20	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
56	MRS GANGA HANUMANT CHANNAR	49	10028234	9480445054	pain in the lumbosacral region	none	10.9	180	YES	NO	1	124/86	76	18	no	no	no	N	N	N	N	N	ABN	N	N	N	N	N	N	N	NO	N	N
57	MRS VAISHALI SURAJ PATIL	48	7294184	9823629889	P3L3 with cystocoele	none	13.9	968	NO	NO	28	110/70	86	24	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
58	MRS YALLAVVVA GANGARAM HAVA	48	7293570	7760883836	P2L2 with endometrial hypetplasia	none	10.4	1871	NO	NO	1	128/76	90	20	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
59	MRS ANJALI BHARAT BONGLE	54	7274728	9901523264	P2L2 with acute GE	none	13.4	2000	NO	NO	6	132/70	88	20	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
60	MRS SAVITA BHRAHMANAND MOTA	46	7301643	9945009529	P3L3 with cystocoele	hypothyroid	11.6	160	YES	NO	2	110/75	60	19	no	no	no	N	N	AbN	N	N	AbN	AbN	AbN	N/A	N	N	N	N	NO	N	N
61	MRS LILABAI KESHAV PATIL	74	7302646	9743789316	P2L2 with tingling sensation	none	13.8	2000	NO	NO	18	148/88	90	18	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
62	MRS GANGAVVA IRAPPA CHANDRA	49	7303815	9538443320	P2L2 with acute GE	none	11.6	677	NO	NO	3	128/76	93	20	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
63	MRS SHANTADEVI MALLAYYA KAVA	70	964528	9731410506	P2L2 with fatigue	none	12.6	338	YES	NO	21	138/100	98	20	no	no	no	N	N	N	N	N	N	N	ABN	N	N	N	N	N	NO	N	N
64	MRS TRISHAL AJIT AWATE	52	4780392	8050324599	P3L3 with post menapausal bleed	none	8.6	100	YES	YES	5	136/74	80	18	yes	no	no	N	N	N	AbN	N	N	N	N	NA	N	N	N	AbN	NO	AbN	AbN
65	MRS SUREKHA MALLAPA MASTIHOL	54	6442629	9110206464	Backpain for evaluation	none	11	263	YES	NO	3	130/74	89	24	no	no	no	N	N	N	N	N	ABN	N	ABN	N	N	N	N	N	NO	N	N
66	MRS JAYASHREE YARAGUPPI	52	7314387	8951514015	P2L2 with acute GE	none	10.3	300	NO	NO	6	144/96	88	20	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
67	MRS LAXMI CHANDRAKANT PATIL	48	7310841	8904172094	P2L2 with fatigue	none	9.4	2000	NO	NO	2	130/90	79	20	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
68	MRS MEERA SATISHKUMAR KARADE	50	10034014	9449016006	P1D1 with pain abdomen	none	11.1	204	NO	NO	2	124/86	97	18	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
69	MRS SHASHIKALA SHANKAR KAROS	51	10034546	9984845387	P2L2 with fatigue	none	8.8	1491	NO	NO	3	132/80	88	18	YES	no	no	N	EXAGERATE	N	AbN	N	N	N	N	N	N	N	N	N	NO	N	ABN
70	MRS MAHADEVI MAHANTESH DEEV	53	6493904	9449020386	P2L2 with mass per abdomen	none	10.7	287	NO	NO	5	124/78	97	20	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
71	MRS GIRIJA BHIMAPPA NANDI	66	4577467	9739475533	P4L4 with low back pain	none	13.1	456	NO	NO	20	130/74	90	20	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
72	MRS GRACE MOHAN MUDALGI	58	2559411	9060182218	P3L3 with auv prolapse and burning mictuir	none	13.2	2000	YES	NO	9	110/70	89	22	no	no	no	N	EXAGERATE	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
73	MRS YALUTAI CHANDRAKANT SAWA	52	10036347	9740981529	P1D1 with pain abdomen	none	11.6	1153	NO	NO	4	130/80	99	18	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
74	MRS HANAMAVVA MALLAPA GUMN	48	7321926	9964177464	P2L2 with epigastric pain	controlled HTN	10.1	306	NO	NO	4	110/70	98	22	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
75	MRS BHARATI SHIVAPPA KAMBAR	52	7328871	9164671527	P2L2 with nueropathy	none	13.4	231	NO	YES	4	130/80	99	16	yes	no	no	N	N	N	N	N	ABN	ABN	N	N	N	N	N	N	NO	N	N
76	MRS AARATI ANAND PATIL	47	6472220	8748872949	P2L2 with acute GE	none	12.3	244	NO	NO	1	124/86	89	16	yes	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
77	MRS MANIK MARUTI TALAWAR	51	6951605	6364003484	P1D1 with pain abdomen	none	9.2	311	NO	NO	2	130/80	88	20	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
78	MRS AKKATAI SHIVGONDA PATIL	65	7330510	8308664050	P2L2 with uv prolapse	none	13.1	2000	NO	NO	17	130/80	90	18	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
79	MRS ANUSUYA PARAPPA CHOUGUL	61	7338592	9945309034	P1D1 with pain abdomen	none	12.7	467	YES	NO	15	128/76	89	16	no	no	no	N	N	N	AbN	ABN	N	N	N	N	N	N	N	N	NO	N	N
80	MRS BANUBI NYAMATULLA MOMIN	60	7340657	8747847807	P3L3 with back pain and shoulder pain	none	13.9	970	NO	NO	12	130/80	98	18		no	no	N	N	N	N	N	N	N	N	AbN	N	N	N	N	NO	N	N
81	MRS RENUKA LAXMAN KANGRALKA	64	7340592	9535244924	P4L4 with low back pain	none	13	180	NO	NO	18	140/88	90	20	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
82	MRS BHARATI MAHADEV BANATTI	47	7369637	8277023124	P2L2 with white discahrge PV	none	12.5	145	YES	NO	4	130/80	87	20	no	no	no	Abn	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
83	MRS ARATI GAJANAN KAKATKAR	48	5391667	9980864604	P1L1 with post menapausal spotting	none	14.4	407	NO	NO	2	124/86	88	16	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
84	MRS PARVATI MARUTI DURGI	68	7373348	9620157484	P2L2 with uv prolapse	controlled HTN	9.3	193	YES	YES	17	128/76	87	22	no	no	no	N	N	N	N	N	N	ABN	ABN	N	AbN	N	N	N	NO	N	ABN
85	MRS RESHMA GANAPATI	48	7093393	6005504255	P3L3 with headache	none	11.8	1642	NO	NO	1	150/92	78	22	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
86	MRS SAVITA UMESH PATIL	46	7237952	9686506365	P1D1 with pain abdomen	none	11	2000	NO	NO	3	130/74	74	18	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
87	MRS SUSHILA SHANKAR PATIL	58	4930714	9845176527	P2L2 with exsessive vomiting	none	12	269	YES	NO	8	128/76	84	20	no	no	no	N	N	ABN	AbN	N	ABN	N	N	N	N	N	N	N	NO	N	N
88	MRS INDUBAI SHIVARAY CHAVAN	47	7380327	9823870866	EXECUTIVE CHECK UP	none	12.3	1312	NO	NO	2	110/70	95	20	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
89	MRS CHAITRA IRANNA NAIKAR	50	7384649	7795925682	P3L3 with headache	hypothyroid	6.9	355	YES	YES	4	124/78	99	22	YES	no	no	N	N	N	N	ABN	ABN	N	ABN	N	N	N	N	N	NO	AbN	N
90	MRS SAKREVVA RAMESH KOLKAR	60	7386255	7676490169	P2L2 with breathlessness	none	10.1	489	NO	YES	12	130/80	97	20	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	AbN	ABN
91	MRS PARVATI LAXMAN GURAV	68	7389082	9591398072	P1L1A2 with mass per abdomen	none	12	2000	NO	NO	16	132/80	98	24	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
92	MRS SAROJINI MALLIKARJUN KOLHA	66	7390224	9632748222	P2L2 with sleeplessness and fatigue	none	10.5	296	NO	NO	18	124/78	95	22	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
93	MRS ELIZABETH FRANCIS	67	7391621	8722598955	P2L2 with vault prolapse	none	12.9	333	YES	NO	8	110/70	86	19	no	no	no	N	N	AbN	AbN	N	N	N	N	N	N	N	N	N	NO	N	N
94	MRS SHANTAVVA SATTAPPA VANN	60	7347255	7795730064	P2L2 with epigastric pain	none	10.3	2000	NO	YES	13	144/96	95	22	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	YES	NO	N	N
95	MRS MEENAXI NIRANJAN PATIL	47	3048882	7090813016	P2L2 with pain abdomen	controlled HTN	12.3	404	NO	NO	3	150/100	87	22	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
96	MRS YALLAVVA MALLAPPA	50	6963165	6361230658	P2L2 with uv prolapse	none	10.5	97	NO	NO	15	130/74	88	18	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
97	MRS SUSHILA PRASAD	60	1190451	9910567343	P3L3 with cystocoele	none	12.2	389	NO	NO	10	124/86	88	22	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
98	MRS SONAVVA DHARNENDRA BUDA	53	10038862	9632842106	P3L3 with auv prolapse	none	12.3	187	NO	NO	6	124/78	84	20	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
99	MRS MANANDA MUTTEPPA ARABHA	50	10038850	9731577901	P3L3 with back pain and shoulder pain	none	11.9	367	NO	NO	1	130/74	93	22	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N
52	MRS JYOTHI	68	7285881	7889894218	P4L3D1 with pain abdomen	none	9.4	2000	NO	NO	19	146/102	98	18	no	no	no	N	N	N	N	N	N	N	N	N	N	N	N	N	NO	N	N