"PREVALENCE OF WORK-RELATED MUSCULOSKELETAL DISORDERS AMONG DENTAL PRACTITIONERS IN BELAGAVI CITY"

Submitted by

(REG. NO. BD0122009)

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for

Dr. GIRIJA J MAHANTSHETTI MD
Professor and Head,
Department of Community Medicine,
J. N. Medical College,
KAHER, Belagavi,
Karnataka, India - 590010.

Date: 28/03/2025
Place: Belagavi

PROFESSOR & HEAD
Dept. of Community Medicine
J. N. Medical College, Belagavi.

Dr. (Mrs.) N. S. MAHANTASHETTI MD
Principal,
J. N. Medical College,
KAHER, Belagavi,
Karnataka, India - 590010.

PRINCIPAL
Jawaharlal Nehru Medical College
BELAGAVI

Date: 28/03/2025
Place: Belagavi

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Nehru Nagar, Belagavi- 590 010, Karnataka, INDIA

0831 – 2471350 0831 – 2470759 www.jnmc.edu rincipal@jnmc.edu

Ref No: MDC/PG/ Date: 29-03-2025

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Principal,
J. N. Medical College, Belagavi.

PRINCIPAL
Jawaharlal Nehru Medical College
Belagavi

To,
Reg. No. BD0122009
Postgraduate Student,
2022-23 Batch,
Department of Community Medicine
J. N. Medical College, Belagavi.

ETHICAL CLEARANCE

K.L.E. ACADEMY OF HIGHER EDUCATION AND RESEARCH
(Deemed – to- be- University)
Accredited 'A+' Grade by NAAC in (3rd Cycle) Placed in Category 'A' by MHRD (GoI)
JNMC INSTITUTIONAL ETHICS COMMITTEE
JAWAHARLAL NEHRU MEDICAL COLLEGE,
NEHRU NAGAR, BELAGAVI-590010 (KARNATAKA-INDIA)
Website: http//www.jnmc.edu
E-Mail : dome@jnmc.edu
Phone: (+ 91-(0)831 Office : 2472550
Principal: 2471701
Fax No. +91 (0)831 – 2470759

Ref No.MDC/JNMCIEC/ 45 **Date: 31/03/2023**

To,

(REG No: BD0122009)
PG Student in Community Medicine
J. N. Medical College,
BELAGAVI.

Sub: Institutional Ethical Clearance for the study.

With reference to the above, we wish to inform you that your proposed research project titled **"PREVALENCE OF WORK-RELATED MUSCULOSKELETAL DISORDERS AMONG DENTAL PRACTITIONERS IN BELAGAVI CITY",** is ethical and justifiable. The proposed research project has been cleared by the JNMC Institutional Ethics Committee.

(Dr. Smita Sonoli)
Member Secretary
JNMC Institutional Ethics Committee
J.N.Medical College, Belagavi.

(Dr. Harsha Hegde)
Chairman,
JNMC Institutional Ethics Committee
J.N.Medical College, Belagav

LIST OF ABBREVIATIONS USED

SL.NO	ABBREVIATIONS	EXPANSION OF THE ABBREVIATIONS
1	KLE	Karnataka Lingayat Society
2	KAHER	K.L.E Academy of Higher Education Research
3	JNMC	Jawaharlal Nehru Medical College
4	VKIDS	Vishwanath Katti Institute of Dental Sciences
5	WMSDs	Work-related musculoskeletal disorders
6	WRMSDs	Work-related musculoskeletal disorders
7	MSDs	Musculoskeletal disorders
8	OOS	Occupational Overuse Syndrome
9	RSI	Repetitive Strain Injuries
10	CTD	Cumulative Trauma Disorders
11	WHO	World Health Organisation
12	GBD	Global Burden of Disease
13	YLDs	Years lived with disability
14	ADA	American Dental Association
15	RULA	Rapid Upper Limb Assessment
16	QEC	Quick Exposure Check
17	CCF	Cranio-cervical Flexion Test
18	IDA	Indian Dental Association
19	IEC	Institutional Ethics Committee

20	NMQ-E	Extended Nordic Questionnaire
21	BDS	Bachelor of Dental Sciences
22	MDS	Master of Dental Sciences, MDS
23	BMI	Body Mass Index

ABSTRACT

''PREVALENCE OF WORK-RELATED MUSCULOSKELETAL DISORDERS AMONG DENTAL PRACTITIONERS IN BELAGAVI CITY''

Background:

Work-related musculoskeletal disorders (WMSDs) represent a major occupational health issue for dental professionals, primarily caused by prolonged static postures, repetitive movements, and poor ergonomic conditions. While existing global research demonstrates high prevalence rates, there remains a lack of localized data from regions like Belagavi, India.

Objective:

1.To determine the prevalence of Work-related Musculoskeletal Disorders among dental practitioners in Belagavi City.

2. To assess the socio-demographic and occupational factors associated with Work-related Musculoskeletal Disorders.

Methodology:

A cross-sectional study was conducted involving 491 participants and there were 467 respondents, including faculty members, postgraduate students, and private practitioners, using a validated questionnaire incorporating the Extended Nordic Musculoskeletal Questionnaire (NMQ-E). Statistical analysis employed descriptive methods, chi-square tests, and multivariate logistic regression.

Results:

The findings revealed a high WMSD prevalence of 91.4%, with the neck (38.2%) and lower back (35.1%) emerging as the most commonly affected body regions. Significant Associations were identified between WMSDs and increasing age (100% prevalence among practitioners aged ≥55 years, $p < 0.0001$), having BDS as Education qualification (49.5% had experienced more pain p value<0.001), greater professional experience (97.5% in those with over 15 years of practice, $p = 0.0002$), extended working hours (94.2% among those working more than 6 hours daily, $p < 0.0001$), and physical inactivity (96.5% in non-exercising individuals, $p < 0.004$). Concerningly, only 41.3% of respondents reported receiving ergonomic training during their education.

Conclusion:

There is a critical need for immediate interventions to address WMSDs among dental professionals in Belagavi. Key recommendations include implementing comprehensive ergonomic training programs, introducing workplace modifications, and encouraging regular physical activity to reduce musculoskeletal strain. The study highlights the urgent requirement for improved occupational health practices in dental settings to enhance practitioner well-being and work sustainability.

Keywords:

Work-related musculoskeletal disorders (WMSDs), dental practitioners, occupational health, ergonomics.

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Musculoskeletal health refers to efficient functioning of locomotor system which consists of bones, joints, muscles, tendons and adjacent connective tissues. Impairments in musculoskeletal system due to various causes leads to pain, swelling, redness, stiffness, weakness and temporary or lifelong limitations in mobility and dexterity which reducing people's ability to perform daily activities.[1] Musculoskeletal disorders (MSDs) are relevant across life span from childhood to old age. Based on onset MSDs are of two types, acute disorders which are of shorter duration like fractures, sprains, strains, pain and chronic disorders like primary low back pain and osteoarthritis. These disorders are caused due to various causes like inflammatory diseases, obesity, physical activity and one among the leading cause in MSDs is poor posture and physical activity due to work.[2] There is a strong relationship between MSDs and work environment and working conditions, mainly the physical activities.[3]

Work-related Musculoskeletal Disorders (WMSDs) are defined as multifactorial and series of traumatic events that accumulate in the body as a result of workplace and work characteristics that in due course, have the potential to develop into a more serious injury to the musculoskeletal system.[4] WMSDs are also known as Occupational Overuse Syndrome (OOS)or Repetitive Strain Injuries (RSI) or Cumulative Trauma Disorders (CTD) or Repetitive Motion Injuries or Occupational Cervicobrachial Disorders or Overuse Syndrome or Regional Musculoskeletal Disorders or Soft Tissue Disorders.[4]

WHO considers WMSDs as multifactorial aetiology, Work-related Musculoskeletal Disorders (WMSDs) are caused due to physical factors related to work such as difficult postures, excessive force, static work, awkward postures, high

repetitiveness, cold, vibration, static muscular constrains. Psychosocial factors such as work load, time pressure, little autonomy, monotonous work, lack of support from colleagues.[3]

As per 2019 Global Burden of Disease (GBD) data showed that approximately 1.71 billion people globally live with musculoskeletal disorders, such as low back pain, neck pain, fractures, osteoarthritis, amputation.[2] While the prevalence of musculoskeletal disorders varies by age and people of different ages everywhere around the world are affected. As per the data high-income countries are affected the most as number of people affected are 441 million, followed by WHO Western Pacific Region countries with 427 million people affected and South-East Asia Region with 369 million people affected. Musculoskeletal disorders are also the biggest contributor to years lived with disability (YLDs) worldwide with approximately 149 million YLDs, accounting for 17% of all YLDs worldwide.[2]

The prevalence of WMSDs and associated risk factors has been evaluated in a number of countries, including Taiwan, Iran, India, Brazil, and Australia, with rates ranging between 40% and 70%. Poland's prevalence rate is 60%, lower than Sweden's (54%), but slightly higher than Wale's (64%). Other studies found a greater frequency of WMSDs among general practitioner dentists in Germany (95.8%), Denmark (83%), and Italy (91%). The global prevalence of WMSDs among dental practitioners ranged from 64% to 93%. [5]

Similarly, prevalence of WMSDs and associated risk factors among dental practitioners has been assessed in various states of India and has been found to be in the range of 58.5-100%. [3,6-10] WMSD's can lead to an inordinate amount of sick leave, a decline in professional performance, premature retirement from profession,

rehabilitation and excessive workloads can also cause work-related stress, leading to psychological diseases such as tension, depression, emotional weariness, and demotivation. These disorders might have medico-legal ramifications.[11]

Dentistry is a tough job that requires tremendous concentration and precision. Dentists require excellent vision, hearing, depth perception, psychomotor abilities, manual dexterity, and the ability to sustain occupational postures for extended periods of time. Long-term exposure to static stress might lead to musculoskeletal problems.[12]

According to the American Dental Association (ADA), more than 20% of dentists suffer from musculoskeletal issues, the most common of which are in the lower back (36.3-60.1%) and neck (19.8-85%). Physical factors that cause musculoskeletal disorders in dental practitioners can be broadly classified into three categories: work environment, hand strength, and posture. The work environment includes unit seats and devices. The material or surface roughness of the devices and gloves influences hand strength. Finally, the posture employed to maintain and manage instruments needing significant power during dental treatments causes MSD. MSD can be caused by a variety of causes, and correlations can be identified in each section of the body. Poor posture and work habits are likely to be the most significant factors. Dentists' job includes various well-known risk factors for musculoskeletal complaints in general, including low back discomfort. The following common postures among dentists are considered danger factors. The forward bent, sitting posture is accompanied by bending and twisting, as well as relatively static work.[13,14]

According to WHO, Ergonomics is most important factor for prevention of WMSDs. Ergonomics is described as the design of work tasks and job demands that match the workforce's capabilities. The purpose of ergonomics is to decrease and

prevent musculoskeletal disorders caused by a variety of variables, and the basic principle of ergonomics is to create a proper balance between the requirements of the work and the capacity of the working person, by either adapting the work to the person by design of the respective work or by developing the capacity of the humans to the work through training and vocational adjustment.[2]

Despite doctors' understanding of preventative techniques, work-related musculoskeletal disorders (WMSDs) still occur. Only few studies available with respect to WMSDs among dental practitioners in Karnataka and southern part of India, therefore there is a need to examine the prevalence of WMSDs among dental practitioners in Belagavi.

AIMS AND OBJECTIVES

1. To determine the prevalence of Work-related Musculoskeletal Disorders among dental practitioners in Belagavi city.
2. To assess the socio-demographic and occupational factors associated with Work-related Musculoskeletal Disorders.

REVIEW OF LITERATURE

A cross-sectional study was conducted among 93 Dentists of two randomly selected colleges of Bhopal, India, to determine the prevalence of work related Musculo-Skeletal disorders among dentists in Bhopal region and explored the various risk factors for the development of Musculo-skeletal disorders and work-related Musculo-skeletal disorders. The results indicated that more than 92% of the participants reported pain and discomfort in at least one part of their body and the primary risk factors for the development of musculoskeletal disorders among dentists included being younger, male, engaging in physical activity, not receiving education on ergonomics during dental school, and having never attended any workshops on the subject. [3]

A nationwide cross-sectional survey was conducted among 646 dentists in India using a self-reported questionnaire to evaluate the prevalence of work-related musculoskeletal disorders (MSDs) among dental professionals. The findings revealed a 100% overall period prevalence rate, with the most common symptoms being pain (99.06%), followed by discomfort (12.87%), fatigue (8.39%), stiffness (3.35%), clicks/sounds (4.1%), and other neurogenic symptoms (20.14%). Additionally, 76.11% of respondents reported recurrent symptoms. The study emphasized the need for widespread ergonomic assessments and enhanced education to reduce work-related MSDs and maintain professional efficiency among dentists in India.[4]

A cross-sectional study was conducted among 400 dental professionals working in various clinics and universities in Sana'a City, Yemen. Results showed that 63.2% of participants reported no musculoskeletal pain before starting dental practice, approximately 73% experienced pain related to their workload after

beginning their careers. Around 42% of participants reported experiencing mild pain. The most frequent areas of pain were the neck (57.33%), lower back (48.88%), and upper back (43.11%) and the study also showed that Only 30% of participants reported engaging in physical stretching activities.[5]

A cross-sectional study was conducted among 500 dental professionals from 2016 to 2017 to report the prevalence and distribution of MSDs among dental professionals practicing in Nagpur, India, further the professionals were divided into 3 groups based on years of experience. Results showed that the prevalence of pain varied across the groups. In Group A, 24% of participants reported lower back pain, while 4% reported pain in multiple regions. Group B showed a similar trend, with 27% experiencing lower back pain and 5% experiencing pain in multiple regions. Group C had the highest prevalence of both lower back pain and multiple region pain, with 34% and 17% respectively and the most common specific disorder among dental professionals was tendonitis of the shoulder and repetitive strain injury and there was also an increasing trend in the presence of neurological pain with increase in number of years in dental practice. The study concluded that the musculoskeletal region most frequently affected was lower and upper back and since the pain involving the body parts depends on the posture, time, and procedures, a daily routine should be followed by dental professionals, with exercise or yoga for strain-free muscular activities.[6]

A cross-sectional study was carried out among dentists in Ahmedabad and Gandhinagar, India, between April and July 2021 to evaluate the point and period prevalence of work-related musculoskeletal disorders (WMSDs) and analyze associated risk factors, including workstation conditions. The findings revealed an 85% period prevalence and 23.3%-point prevalence of WMSDs, with prosthodontists experiencing the highest rates, particularly in the neck (64.7%). Key risk factors

identified included higher BMI, advanced qualifications, inadequate breaks, poorly designed workstations, frequent elbow bending, repetitive motions, tasks requiring reaching beyond 20 inches, and waist twisting. The study concluded that these factors significantly increase the risk of developing MSDs among dental professionals.[7]

A study conducted among dentists of Visakhapatnam, Andhra Pradesh during 2016 aimed to investigate the prevalence of self-reported work-related musculoskeletal disorders (WRMSDs) over the past 12 months and identify associated influencing factors. A self-administered questionnaire was distributed to a selected sample of practicing dentists, and data were collected using the Nordic Musculoskeletal Questionnaire. Musculoskeletal pain was most frequently reported in the neck (56%), followed by the hand (39%), lower back (32%), and shoulder (18%). A significant association was found between neck pain and gender, age, height, and weight. Lower back pain was significantly associated with gender, body mass index (BMI), height, and years of experience. Hand pain, however, was only significantly associated with years of experience as a dentist.[8]

A cross-sectional study was conducted in Mumbai, India among 250 dental surgeons to identify various musculoskeletal problems of dental surgeons and the results indicated that the most commonly affected area among male subjects was the neck, and in female subjects, maximum pain was in wrist and hand, revealing that almost all the participants reported musculoskeletal pain. The study concluded that there was a significant association between the work posture, lifestyle, environmental factors, and MSDs.[9]

A cross-sectional study was conducted among 188 medical specialities professionals on Mangalore, India to assess the prevalence of MSDs among doctors.

The results showed that lower back (25%), neck (20.12%) and knee (14.36%) were the common MSDs in doctors. Also, MSDs association with respect to age, gender and work experiences were non-significant except, physical activity. The study concluded that MSDs were most common in doctors.[10]

A study was conducted in Korea in 2015, which aimed to ergonomically assess the work posture of dentists to evaluate their risk of developing musculoskeletal disorders. Video recordings were made of three dentists performing procedures in their dental clinics. These recordings were subsequently analysed using the Rapid Upper Limb Assessment (RULA) and Quick Exposure Check (QEC) methods. The RULA analysis indicated that the posture adopted for treating the anterior teeth required improvement, while the posture used for treating the maxillary second molar required immediate correction. Among all postures examined, the highest risk was identified in the lower back and neck, highlighting significant issues in these areas. The QEC analysis further revealed that the posture required for treating the maxillary second molar posed the greatest risk, particularly for neck problems and exposure to vibrations.[12]

A cross-sectional study was done in 2011 among the general dental practitioners in Iran, to review musculoskeletal disorders in the neck region among general dental practitioners using a Cranio-cervical Flexion Test (CCF) along with the Nordic questionnaire. Among the dentists surveyed, 83.3% reported experiencing cervical pain, 56.7% complained of back pain, and 41% reported shoulder problems. And female dentists were found more at risk of neckache, discomfort and pain in shoulder and hand than males. Greater pain frequency in knee was found in more experienced and older age dentists ($P = 0.07$) and CCF test showed that the deep cervical flexor muscles endurance increased with regular exercise and decreased with

aging. The study concluded that as a consequence of occupational stresses many dentists experience the musculoskeletal disorders and so standards of work position, regular exercise and following the ergonomic policy are intensely recommended.[14]

A study was carried out in Ludhiana, India, involving 146 dentists to examine the prevalence of work-related musculoskeletal disorders (MSDs) and evaluate their awareness, attitudes, and practices concerning dental ergonomics. The findings revealed that a significant majority of the dentists (91%) experienced MSDs, with the most frequently affected regions being the neck (70.5%), followed by the shoulder (48.7%), lower back (47.3%), and upper back (41.8%).[15]

A cross-sectional study was conducted of 322 dental students and dentists from two universities in Saudi Arabia, to measure ergonomic awareness and work-related MSDs using Nordic questionnaire. The results indicated Over the previous 12 months, 81.33% of participants experienced pain, aches, or discomfort in at least one part of their body. The most common sites for work-related musculoskeletal disorders (WRMSDs) were the upper back (48.19%), wrists/hands (44.27%), lower back (43.98%), neck (36.45%), and shoulder (33.43%). WRMSDs in most body regions were more prevalent among males and participants from governmental universities compared to females and those from private universities.[16]

A cross-sectional study was conducted among Australian orthodontists and 450 dentists in Queensland to examine the prevalence and risk factors of work-related musculoskeletal disorders (WMSDs). The results showed a high prevalence of musculoskeletal issues among both dentists (88.9%) and orthodontists (83.6%), with work-related stress being a significant contributing factor. Additionally, fewer than one-third of these professionals had received ergonomics training during their formal

education. The study concluded that musculoskeletal problems were highly prevalent among dental practitioners and were linked to workplace stress. It recommended interventions focused on reducing occupational stress and improving ergonomic posture during clinical practice.[17]

A study which was conducted among dentists in Malaysia in 2015, aimed to examine the association between physical and psychosocial factors, as well as ergonomic conditions, with musculoskeletal disorder (MSD) symptoms. A questionnaire was completed by 85 dentists to assess the presence of MSD symptoms in relation to these factors. It was found that the shoulders were the most frequently affected area (92.7%), while MSDs of the neck and upper back most commonly interfered with daily activities (32.9%). And only a small fraction of participants (2.4%) reported MSD symptoms at a single location, 13.4% reported pain in two locations, 26.8% in three, and 28.0% in four, with 14.6%, 11.0%, and 3.7% reporting pain in five, six, and seven locations, respectively.[18]

MATERIALS AND METHODS

A) Source of data:

All the teaching faculties and practicing postgraduates from K.L.E V. K. Institute of Dental Sciences, and Maratha Mandal's Natajirao G Halgekar Institute of Dental Sciences, Belagavi and all the Dental Practitioners of Belagavi City were enrolled in this study.

B) Study Design:

A Cross – Sectional Study

C) Study Period:

1st April 2023 to 31st March 2024

D) Sample Size and Sampling Technique:

Universal Sampling Method was adopted and all the Dental Practitioners enrolled in Indian Dental Association, Belagavi Division, teaching staff and post graduate students of K.L.E V. K. Institute of Dental Sciences and Maratha Mandal's Natajirao G Halgekar Institute of Dental Sciences and Dental doctors practicing in Belagavi city were included in the study and the distribution is as follows

Sl no	Area of data collection	No of study participants
1	K.L.E V. K. Institute of Dental Sciences, Belagavi - Teaching staff	87
2	KLE V.K. Institute of Dental Science, Belagavi-Post Graduate students	120
3	Maratha Mandal's Natajirao G Halgekar Institute of dental sciences- Teaching staff	63
4	Maratha Mandal's Natajirao G Halgekar Institute of Dental Sciences- Post Graduate students	56
5	Dental Practitioners who are part of Indian Dental Association (IDA) Belagavi Division	115
6	Dental Practitioners who are not a part of IDA in Belagavi city	50
7	**TOTAL**	**491**

E) Inclusion Criteria:

1. Registered Dentists doing clinical practice in Belagavi city corporation limits.
2. Teaching faculty in two dental colleges of Belagavi city.
3. Postgraduate students studying in two dental colleges in Belagavi city.

F) Exclusion Criteria

1. 1.Dentists suffering from any co-morbid conditions such as cancers, arthritis, pre-existing musculoskeletal problems (other than caused due to dental practice) and osteoporosis.
2. Undergraduate and interns of the two dental colleges.

G) Ethical Clearance:

Ethical clearance was obtained from the IEC of JNMC, Belagavi for study including human participants vide reference number MDC/JNMCIEC/45 dated 31/3/2023.

Informed consent was obtained from all participants prior to the commencement of data collection. They were thoroughly briefed on the study's objectives, their rights, and any potential benefits and risks associated with their participation. Throughout the study, measures were taken to ensure the privacy and confidentiality of all participants involved in the study.

H) Questionnaire validation:

Data was collected using a pre tested and pre designed questionnaire to collect socio demographic and information related to routine dental practices which was internally validated and Extended Nordic Questionnaire (NMQ-E) was used to detect musculoskeletal disorders among study participants.[19-21]

I) Data collection procedure:

A questionnaire was used to collect data, with prior permission from the principals of K.L.E. V. K. Institute of Dental Sciences, Belagavi, Maratha Mandal's

Natajirao G Halgekar Institute of Dental Sciences, and dental practitioners in Belagavi city, to assess the prevalence and risk factors associated with work-related musculoskeletal disorders (WMSDs)

The study questionnaire composed of 5 sections consisting of personal data and Socio demographic details, details related to dental practices, personal habits, examination findings. Nordic questionnaire was used to assess musculoskeletal disorders of the study participants.

The questionnaire was given to each study participant and was briefed about the WMSDs and objectives of the study and were asked to mark the appropriate answer and the same was documented in this study. Out of 491 participants, 467 participants gave consent to participate in the study and data from the same participants were included in the statistical analysis.

J) Data Processing and Statistical Analysis:

The data collected was entered into Microsoft Excel, where a Master Chart was created. The data was encrypted through coding for each response in the questionnaire. Subsequently, the analysis was conducted using SPSS software Version 20.0.

K) Definition of Study Variables:

The study used established definitions whenever possible to clarify the meanings of the concepts of the present study.

L) Proforma Variables:

Age:

The age of the study participant was defined as the number of completed years since their last birthday.

Education qualification:

Education qualification was grouped into 2 categories depending on their qualification as undergraduate (Bachelor of Dental Sciences, BDS) or as post graduates (Master of Dental Sciences, MDS).

Speciality:

If the post graduate study participant was enrolled in MDS, speciality was grouped into 9 categories Prosthodontics & Crown Bridge, Periodontology, Oral & Maxillofacial Surgery, Conservative Dentistry & Endodontics, Orthodontics & Dentofacial Orthopaedics, Oral & Maxillofacial Pathology & Oral Microbiology, Public Health Dentistry, Pedodontics & Preventive Dentistry, Oral Medicine and Radiology.

Sex:

Gender has been classified into two categories that is male and female

Religion:

Religion was categorized into four main groups that is Hindus, Christians, Muslims and Jains. Others included Sikhs, Zoroastrians (Parsi), and Buddhists.

Marital status:

It was grouped into 3 categories

Married: The term "married" refers to the state of being legally united in marriage, which is a recognized social and legal contract between individuals.

Un-married: Unmarried individuals are those who are not legally married or never married.

Divorced: Divorced individuals are those who are previously married but legally separated.

Type of family:

It was grouped into 3 categories as it follows.

Nuclear: A nuclear family is composed of a married couple and their dependent children.

Joint family: A joint family is comprised of several married couples along with their children, all residing together in a single household.

Tree-generation family: A three-generation family refers to a household where members from three distinct generations coexist under one roof.

M) Personal Habits:

Alcohol consumption:

It was grouped into 4 categories, each representing a different pattern of drinking behaviour.

Every day: This category includes individuals who consume alcohol daily or almost daily.

Once a week: Individuals in this group typically consume alcohol once every week, suggesting a more moderate drinking pattern compared to everyday drinking.

Once in a month: This category comprises of individuals who consume alcohol approximately once per month.

Occasionally: Individuals in this category are those who consume alcohol sporadically, which can vary from a few times a year to once a month**.**

Tobacco consumption:

It was grouped into 3 categories

Smoking:

Smoking tobacco refers to products that are burned and inhaled like cigarettes, cigars and Hookahs.

Smokeless:

Tobacco products that are consumed without combustion such as Chewing tobacco, Snuff, dissolvable tobacco.

Combined: Combined tobacco products contain both smoking and smokeless components, these include e-cigarettes and heated tobacco.

N) Examination findings:

Height: It is defined as measurement of an individual from the base of the foot to the head, it is typically measured in centimetres.

Weight: It is defined as the measure of the force exerted by gravity on an object, commonly measured in kilograms.

BMI: It is a statistical measure that uses an individual's height and weight to estimate body fat**.**

RESULTS

Table 1. Distribution of participants according to age (n=467)

Age (years)	Frequency	Percentage
≤24	43	9.2%
25 to 34	138	29.5%
35 to 44	98	21%
45 to 54	113	24.2%
≥55	75	16.1%
Total	**467**	**100%**

Out of the 467 participants in the study, the largest proportion of participants fell within the 25 to 34 years age group, representing 29.5% of the total sample. This was followed by the 45 to 54 years age group, which accounted for 24.2%, and the 35 to 44 years age group, representing 21%. The ≥55 years age group comprised 16.1% of participants, while the youngest age group (≤24 years) had the smallest representation at 9.2%.

Figure 1. Distribution of participants according to age (n=467)

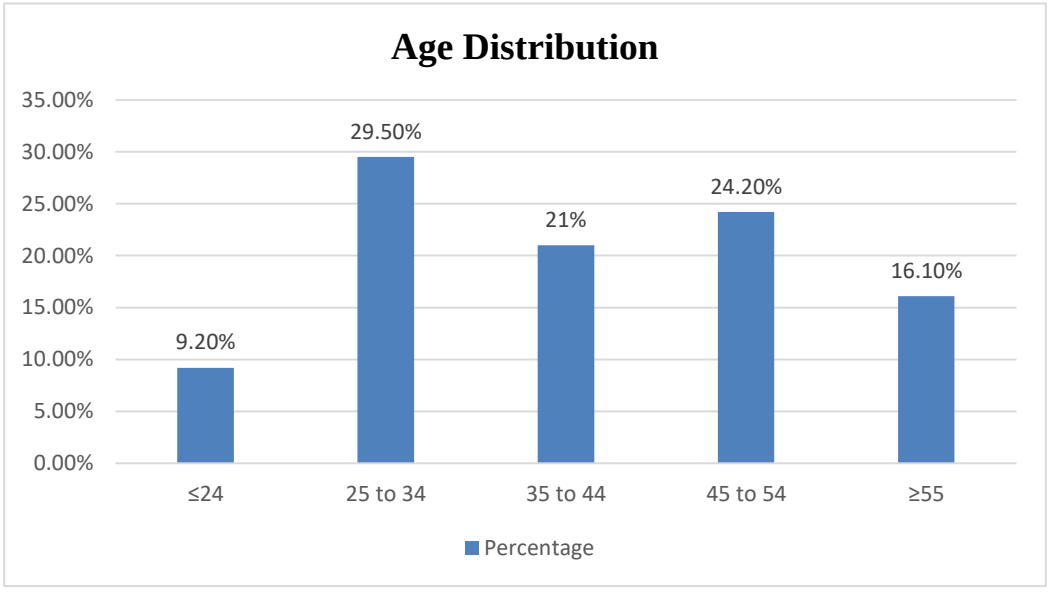

Table 2. Distribution of participants according to gender (n=467)		
Gender	**Frequency**	**Percentage**
Male	211	45.2%
Female	256	54.8%
Total	**467**	**100%**

Out of the 467 participants in the study, females represented the majority at 54.8%, while males accounted for 45.2%.

Figure 2. Distribution of participants according to gender (n=467)

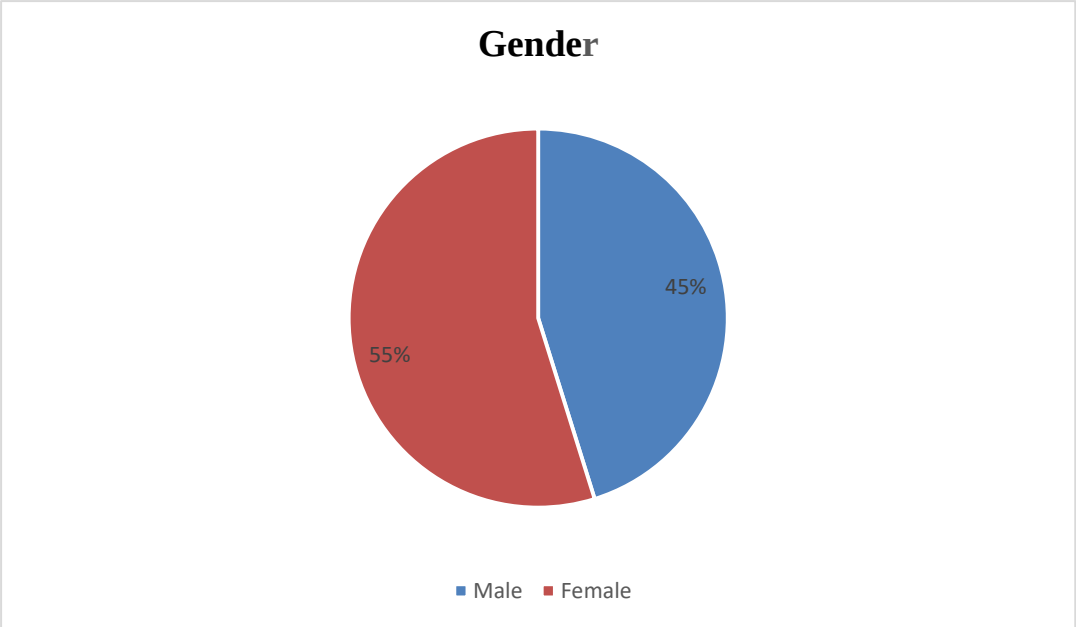

Table 3. Distribution of participants according to religion (n=467)		
Religion	**Frequency**	**Percentage**
Hindu	397	85%
Muslim	48	10.3%
Christian	15	3.2%
Jain	6	1.3%
Others	1	0.2%
Total	**467**	**100.0**

The study of 467 participants showed that the majority were Hindus, comprising 85%. Following that, Muslims accounted for 10.3%, Christians for 3.2%, Jains for 1.3%, and others for 0.2%.

Figure 3. Distribution of participants according to religion (n=467)

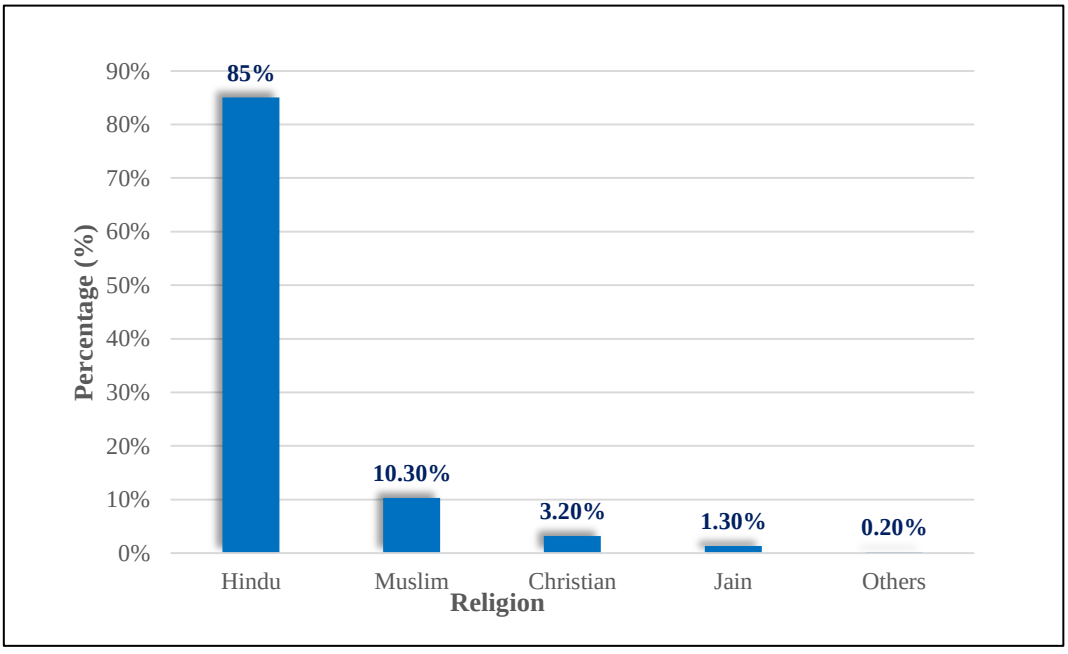

Table 4. Distribution of participants according to Marital Status (n=467)		
Marital Status	**Frequency**	**Percentage**
Married	346	74.1%
Unmarried	112	24%
Divorced	9	1.9%
Total	**467**	**100.0**

Among the 467 Study participants in the study, the majority, were, married 74.1%, Unmarried accounting for 24%, while 1.9% were Divorced.

Figure 4. Distribution of participants according to Marital Status (n=467)

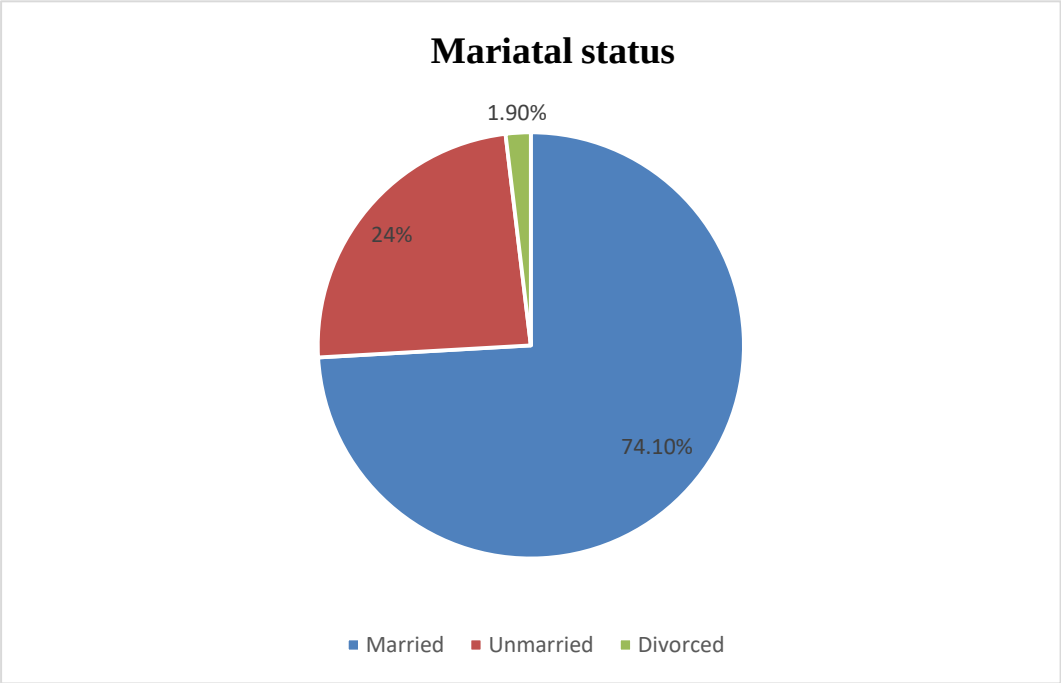

Table 5. Distribution of participants according to type of family (n=467)		
Type of family	**Frequency**	**Percentage**
Nuclear	343	73.4%
Joint	98	21%
Three Generation	26	5.6%
Total	**467**	**100%**

The study of 467 participants showed that the largest proportion belonged to nuclear families, comprising 73.4%. Joint families were the next most common, accounting for 21%, while three-generation families made up 5.6%.

Figure 5: Distribution of subjects based on type of family

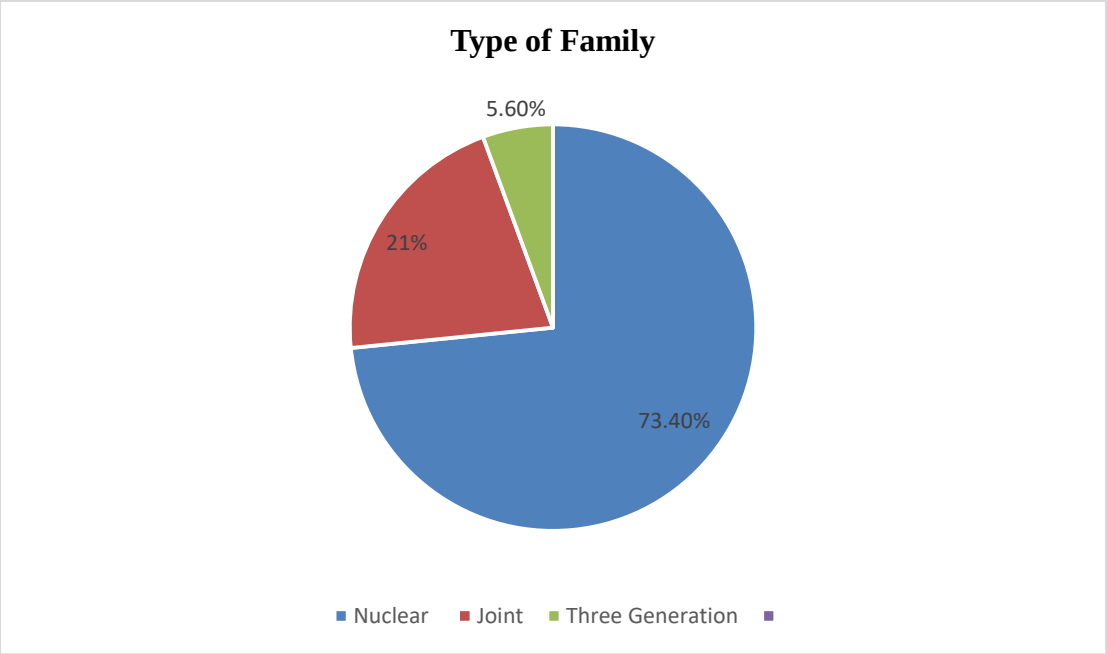

Table 6. Distribution of participants according to educational qualification. (n=467)

Education	Frequency	Percentage
BDS	266	57%
MDS	201	43%
Total	**467**	**100%**

Among 467 study participants, 57% were with a Bachelor degree (BDS) while 43% held a Master's degree (MDS) as qualification.

Figure 6: Distribution of subjects based on Education.

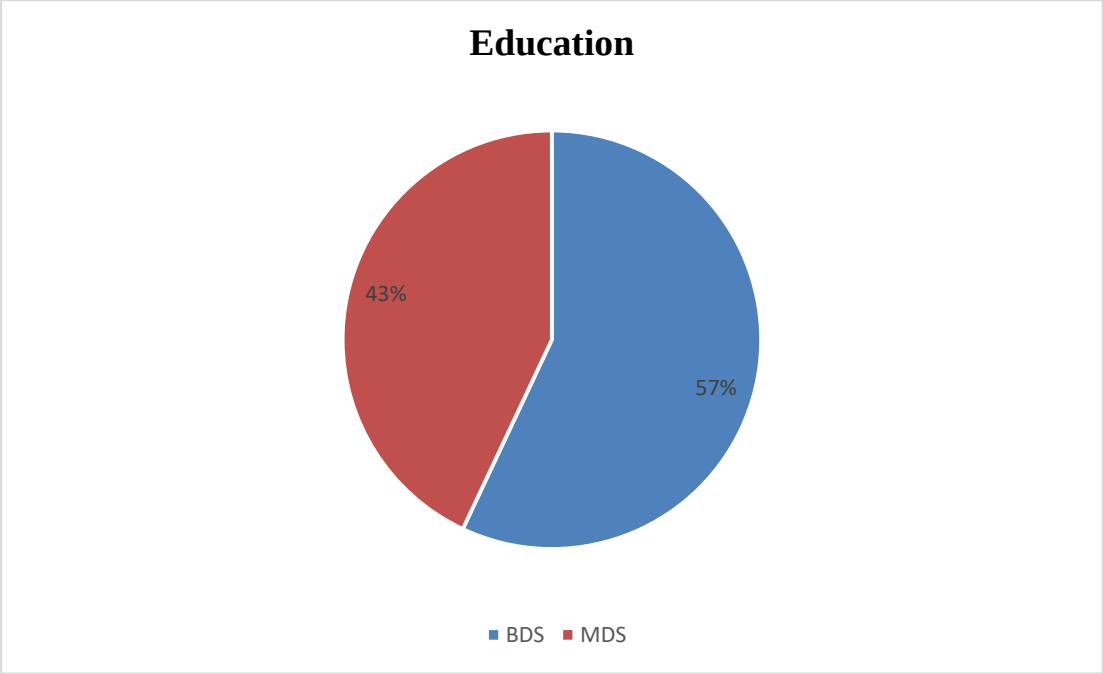

Table 7. Distribution of participants according to Specialty (n=201)		
Specialty	**Frequency**	**Percentage**
Prosthodontics & Crown Bridge	30	14.92%
Oral Medicine and Radiology	18	8.95%
Pedodontics & Preventive Dentistry	8	3.98%
Public Health Dentistry	17	8.45%
Oral &, Maxillofacial Pathology & Oral Microbiology,	19	9.45%
Orthodontics & Dentofacial Orthopaedics,	29	14.42%
Conservative Dentistry & Endodontics,	23	11.44%
Oral & Maxillofacial Surgery,	32	15.94%
Periodontology	25	12.45%
Total	**201**	**100%**

The distribution of participants across dental specialties is as follows, Oral & Maxillofacial Surgery were the largest group with 15.94%, followed by Prosthodontics & Crown Bridge and Orthodontics & Dentofacial Orthopaedics with 14.92% and 14.42%, respectively. Other notable groups include Periodontology with

12.45% and Conservative Dentistry & Endodontics with 11.44%. The remaining specialties had fewer participants, with Oral pathology and microbiology having 9.45%, Pedodontics & Preventive Dentistry being the smallest group with 3.98%.

Figure 7: Distribution of subjects based on Specialty (n=201)

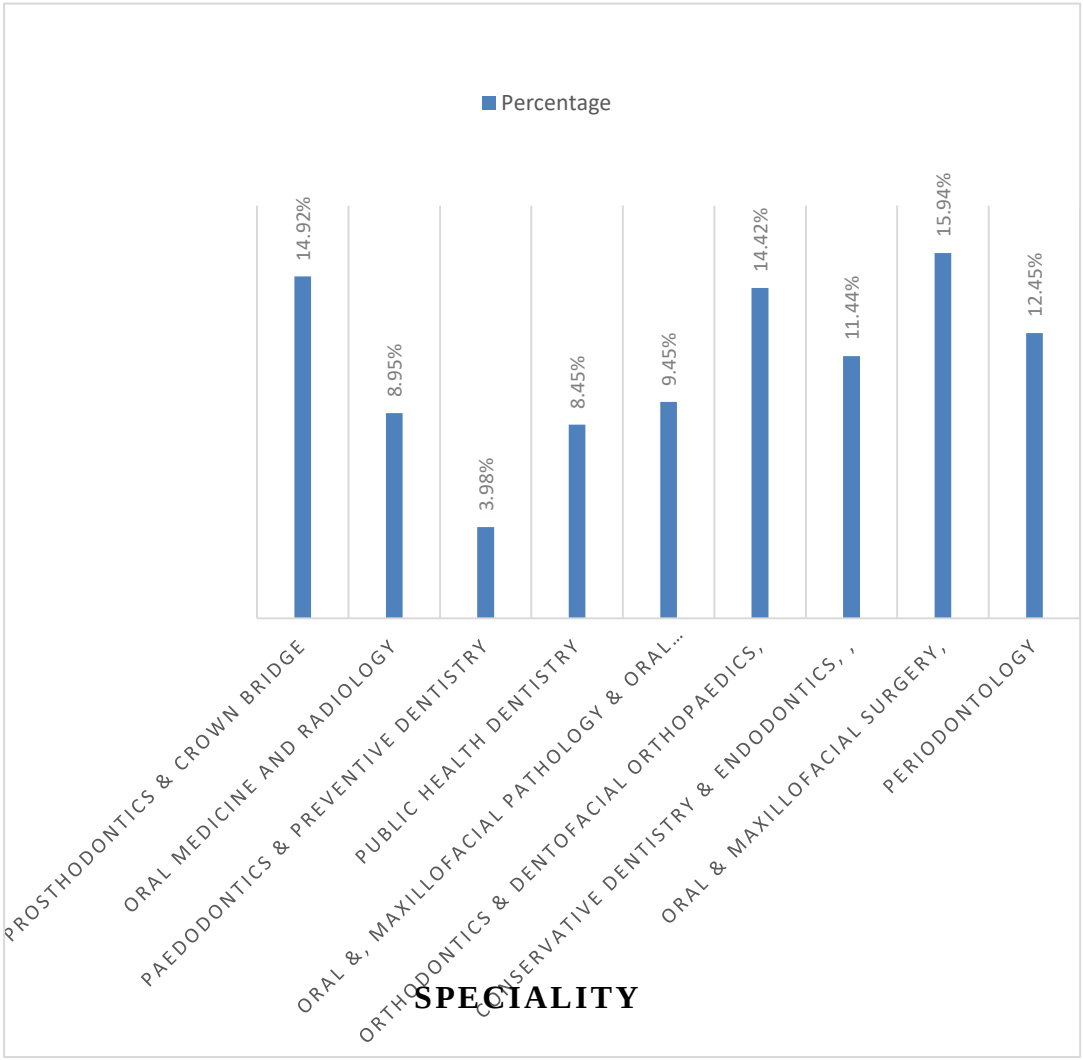

Table 8. Distribution of participants according to felt reason for not practicing dentistry (n=32)

Reason for not practicing Dentistry	Frequency	Percentage
MSD	21	65.6%
Other	11	34.3%
Total	**32**	**100%**

Among the 32 participants, the reasons for not practicing dentistry were categorized as, Musculoskeletal Disorders (MSD) were the most common reason, reported by 65.6%, while the "Other" category accounted for 34.3%.

Figure 8: Distribution of subjects based on to reason for not practicing dentistry

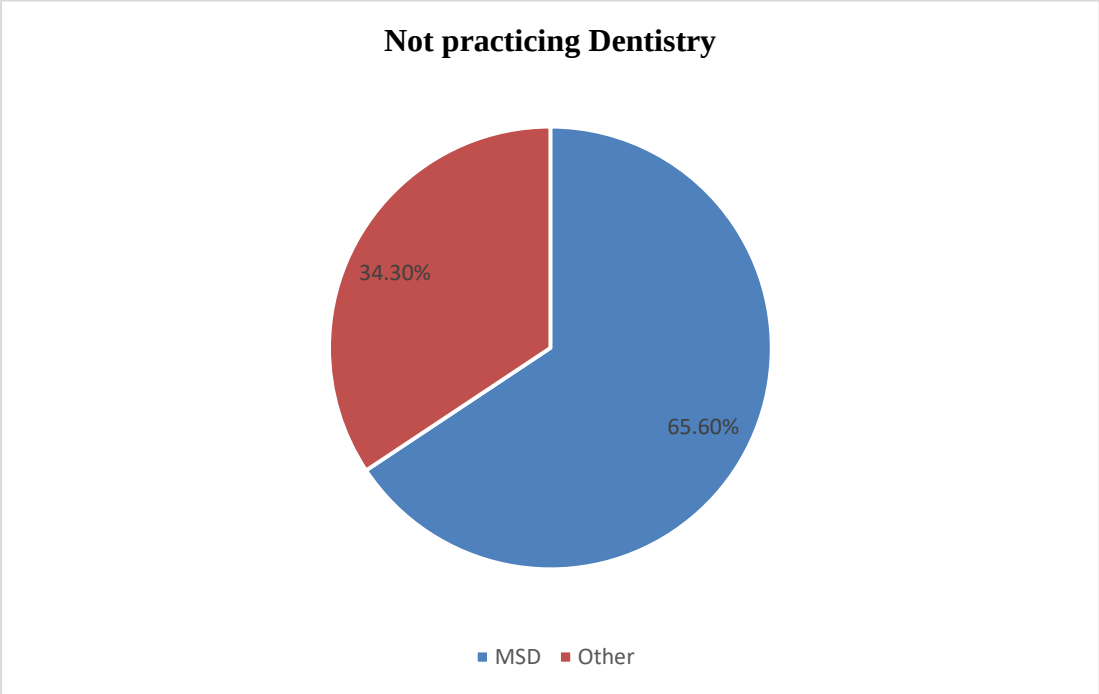

Table 9. Distribution of participants according to other reasons related to not practicing dentistry(n=11)		
Reasons	**Frequency**	**Percentage**
Family issue	2	0.4%
Non clinical branch	6	1.3%
Personal problem	3	0.6%
Total	**11**	**2.3%**

Among the participants, additional reasons for not practicing dentistry included non-clinical branch, which affected 1.3%, Personal problems impacting 0.6%, and Family issues affecting 0.4%.

Figure 9: Distribution of subjects based on other reasons related to not practicing dentistry

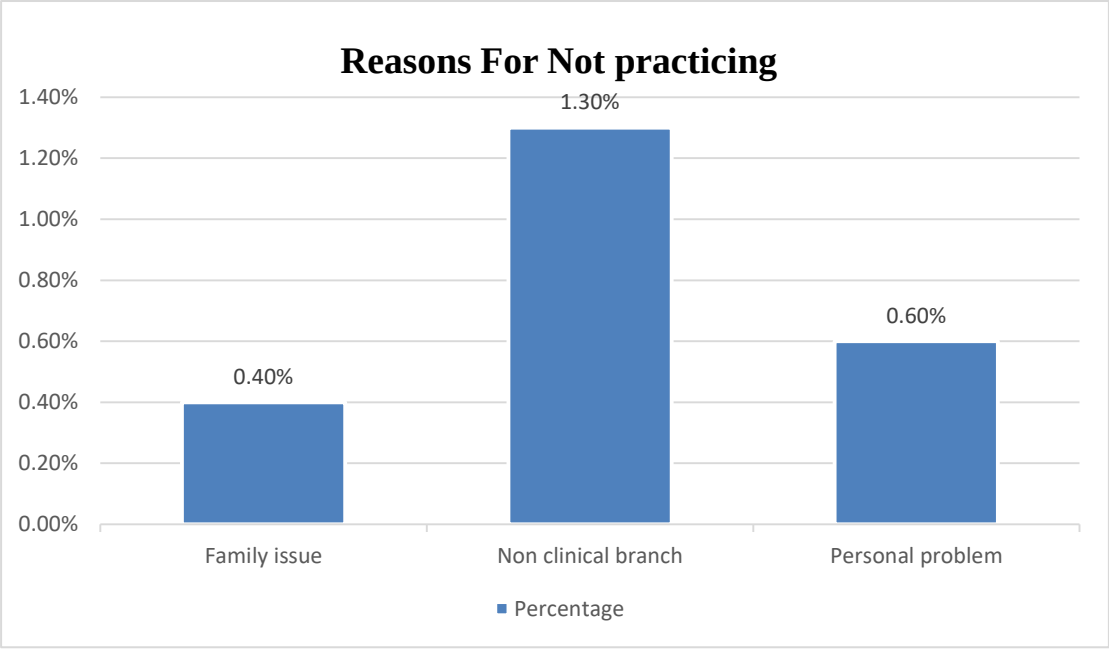

Table 10. Distribution of participants based on Hand dominance (n=467)		
Hand dominance	**Frequency**	**Percentage**
Right	410	87.8%
Left	57	12.2%
Total	**467**	**100%**

Among the 467 participants, the distribution of Hand dominance was that the majority of participants, 87.8%, were right-handed, while 12.2% were left-handed.

Figure 10: Distribution of subjects based on Hand dominance (n=467)

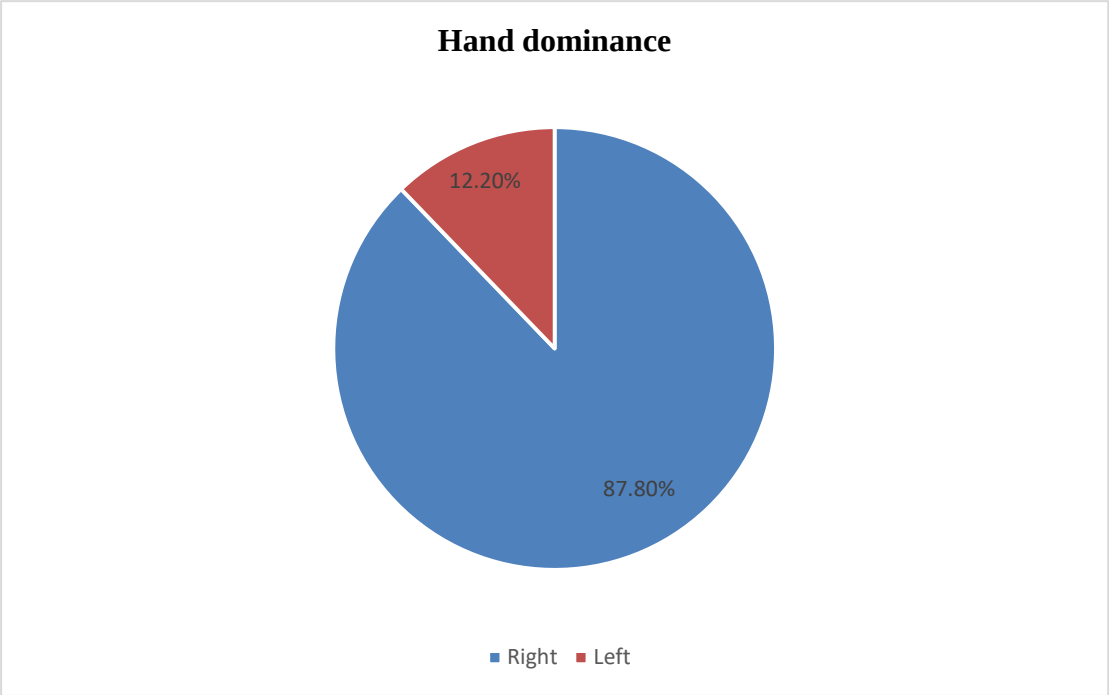

Table 11. Distribution of participants according to Years of practicing dentistry(n=467)		
Years of practice	**Frequency**	**Percentage**
<5	112	24%
5-10	135	28.9%
11-15	99	21.2%
>15	121	25.91%
Total	**467**	**100%**

Among the 467 participants, the distribution of years of practicing dentistry revealed that a diverse range of experience levels. The largest group consisted of dentists with 5–10 years of experience, representing 28.9% of the sample. This was closely followed by those with more than 15 years of experience, who accounted for 25.91% of the participants. Dentists with 11–15 years of experience comprised 21.2% of the sample, while the smallest group was those with less than 5 years of experience, making up 24%. Overall, the findings indicate a balanced representation of early-, mid-, and late-career dentists, with a notable presence of experienced professionals in the workforce.

Figure 11. Distribution of participants according to Years of practicing dentistry

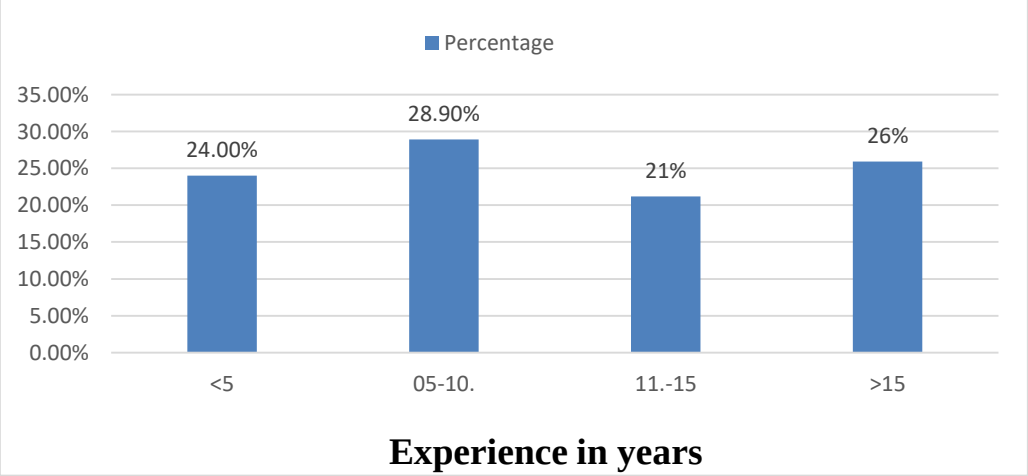

Table 12. Distribution of participants based on Extended breaks (n=467)		
Extended breaks	**Frequency**	**Percentage**
Yes	48	10.3%
No	419	89.7%
Total	**467**	**100%**

Among the 467 participants, the distribution regarding extended breaks showed that a small minority, 10.3%, reported taking extended breaks. In contrast, the vast majority, 89.7%, did not take extended breaks.

Figure 12: Distribution of subjects based on Extended breaks (n=467)

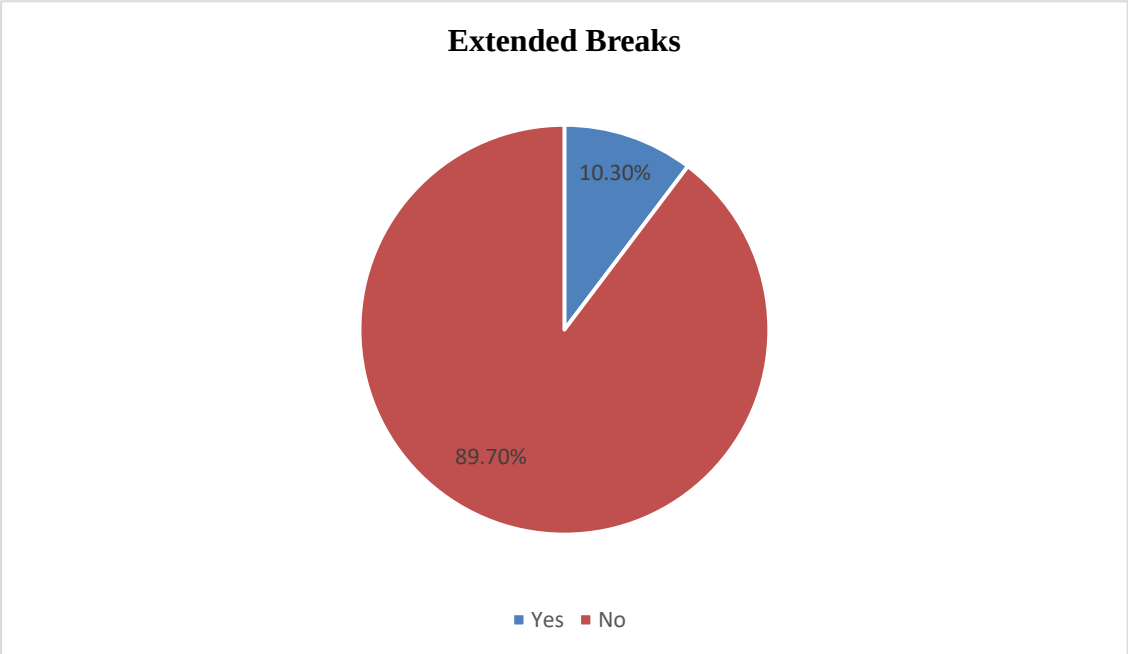

Table 13. Distribution of participants based on Duration of Extended breaks (n=48)		
How long in months (extended breaks)	**Frequency**	**Percentage**
<1	12	25%
1-2	32	66.6%
3-4	1	2.08%
>4	3	6.25%
Total	**48**	**100%**

Among the participants who reported extended breaks, the duration of these breaks varied. The majority, 66.6%, took breaks lasting between 1 and 2 months. A smaller group, 25%, had breaks of less than a month. Only 2.08% took breaks between 3 and 4 months, while 6.25% took breaks longer than 4 months.

Figure 13. Distribution of participants based on Duration of Extended breaks (n=48)

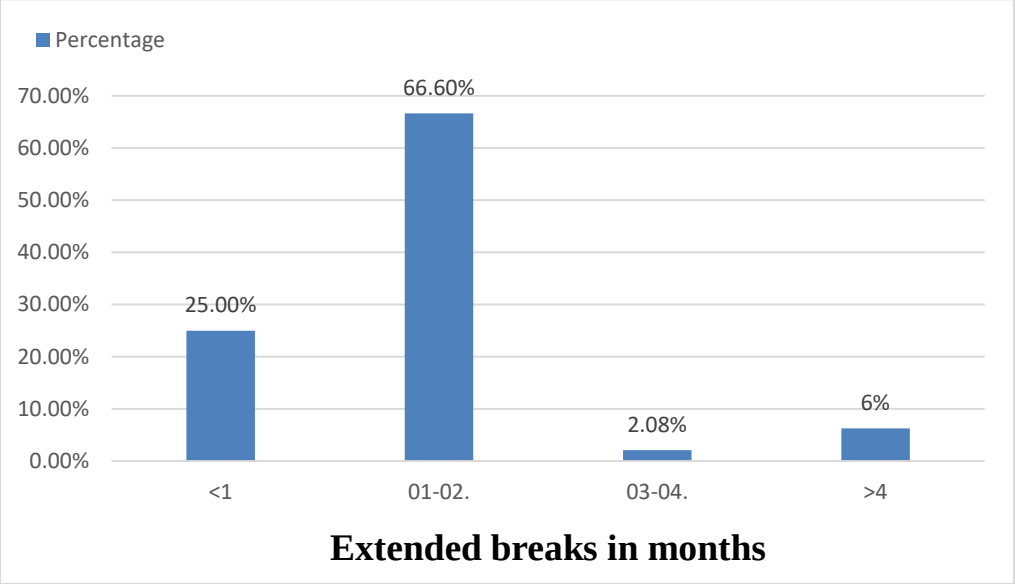

Table 14. Distribution of participants based on Hours of working in Dental practice (n=467)		
Hours of working (in hrs)	**Frequency**	**Percentage**
<3hrs	38	8.1
3-6	189	40.5
>6hrs	240	51.4
Total	**467**	**100.0**

The majority of participants, 51.4% reported working more than 6 hours per day,40.5% of the participants worked for 3-6 hrs, while a smaller proportion of 8.1% worked less than 3 hours per day. This indicates that a significant portion of the study population engages in prolonged working hours in dental practice.

Figure 14. Distribution of participants based on Hours of working in Dental practice (n=467)

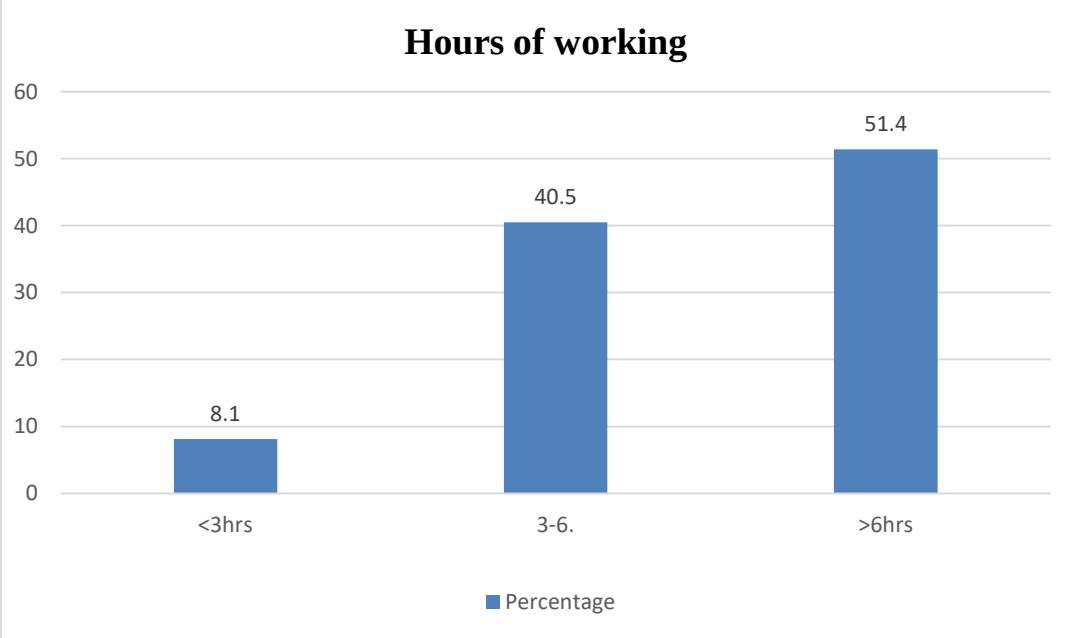

Table 15. Distribution of participants based on Scheduled breaks (n=467)		
Scheduled break	**Frequency**	**Percentage**
Yes	397	85%
No	70	15%
Total	**467**	**100%**

Among the 467 participants, the distribution regarding scheduled breaks revealed that a significant majority 85%, reported taking scheduled breaks. In contrast, a smaller group, 15%, did not take scheduled breaks.

Figure 15: Distribution of subjects based on Scheduled breaks (n=467)

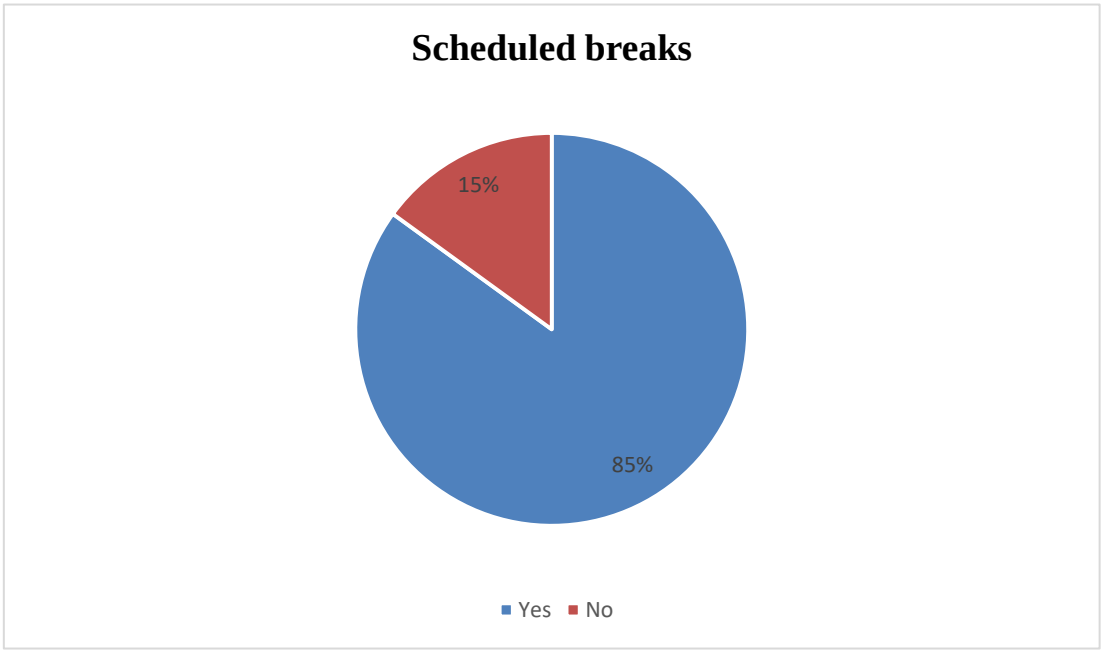

Table 16. Distribution of participants based on No of Scheduled breaks(n=397)		
No of Breaks	**Frequency**	**Percentage**
1	158	39.7%
2	139	35%
3	68	17.1%
4	32	8.2%
Total	**397**	**100%**

Among the 397 participants, the distribution of the number of scheduled breaks showed that 39.7% took one break. This was followed by 35% who took two breaks. A smaller proportion, 17.1%, took three breaks, while 8.2% took four breaks.

Figure 16. Distribution of participants based on No of Scheduled breaks(n=397)

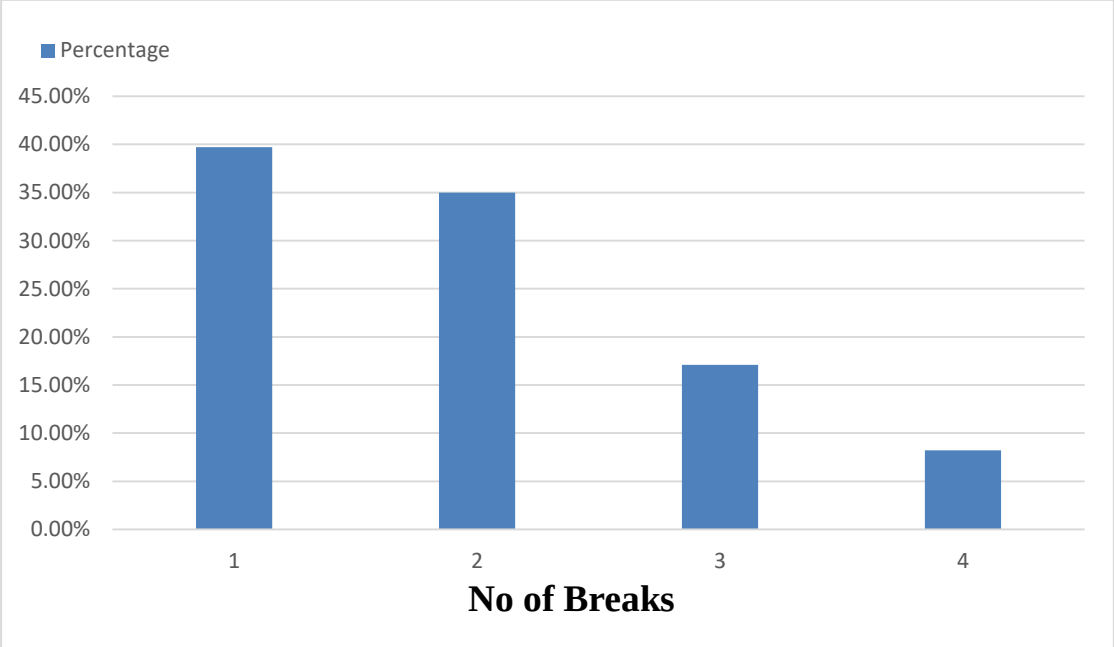

Table 17. Distribution of participants based on treating no of average patients(n=467)

No of average patients	Frequency	Percentage
1-5	66	14.1%
6-10	151	32.3%
11-15	143	30.7%
>15	107	22.9%
Total	**467**	**100%**

Among the 467 participants, the distribution of the average number of patients treated showed that 14.1% treated between 1 and 5 patients. The largest groups were those treating 6-10 patients, which accounted for 32.3%, and those treating 11-15 patients, making up 30.7%. A significant proportion, 22.9%, treated more than 15 patients.

Figure 17. Distribution of participants based on treating no of average patients(n=467)

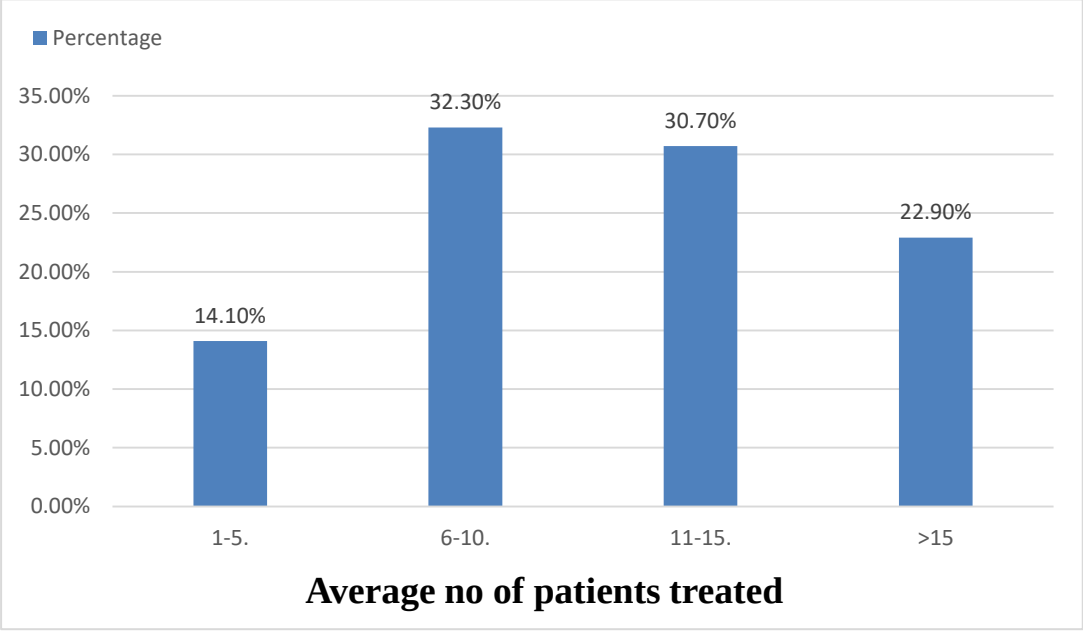

Table 18. Distribution of participants according to posture at work (n=467)		
Work posture	**Frequency**	**Percentage**
Seated	54	11.6%
Mostly seated	278	59.55%
Mostly standing	114	24.4%
Standing	21	4.5%
Total	**467**	**100%**

Among the 467 participants, the distribution of work posture showed that the majority, 59.55%, worked in a mostly seated position. A significant portion, 24.4%, worked mostly standing, while 11.6% were seated throughout their work. The smallest group, 4.5%, worked standing for the majority of their time.

Figure 18. Distribution of participants according to posture at work (n=467)

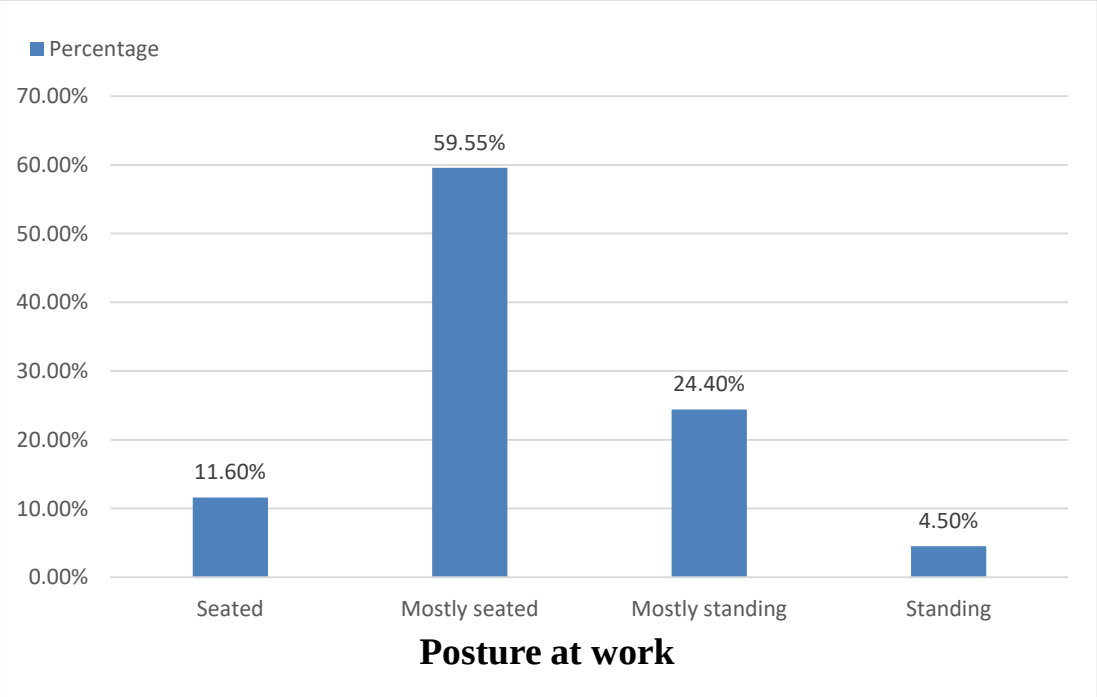

Table 19. Distribution of participants according to use of dental loupes in daily practice (n=467)		
Dental Loupes	**Frequency**	**Percentage**
Yes	196	42%
No	271	58%
Total	**467**	**100%**

Among the participants, the use of dental loupes in daily practice was reported by 42%, indicating that nearly half of the participants utilize dental loupes. However, the majority, 58%, did not use dental loupes in their daily practice.

Figure 19. Distribution of participants according to use of dental loupes in daily practice (n=467)

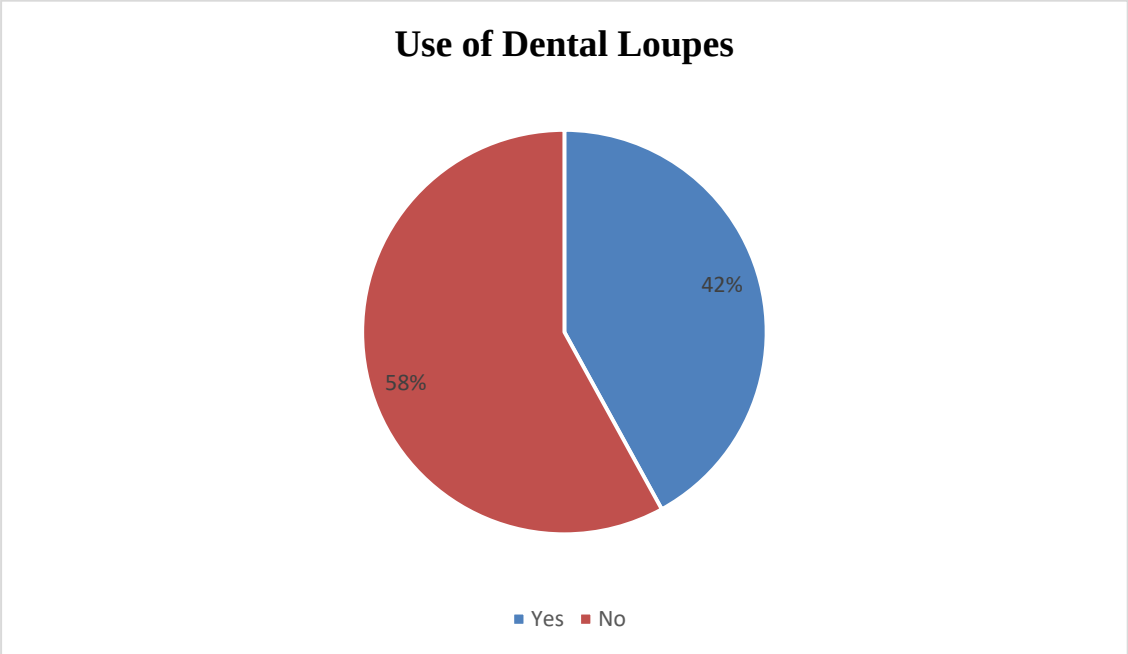

Table 20. Distribution of participants according to Awareness of posture(n=467)		
Aware of posture	**Frequency**	**Percentage**
Always	47	10.1%
Most	177	37.9%
Sometimes	190	40.7%
Never	53	11.3%
Total	**467**	**100%**

Among the 467 participants, awareness of posture showed considerable variation. Only 10.1% indicated that they were always aware of their posture. A larger segment, 37.9%, reported being aware most of the time. The largest group, comprising 40.7%, stated they were sometimes aware, while 11.3% admitted to never being aware of their posture.

Figure 20. Distribution of participants according to Awareness of posture(n=467)

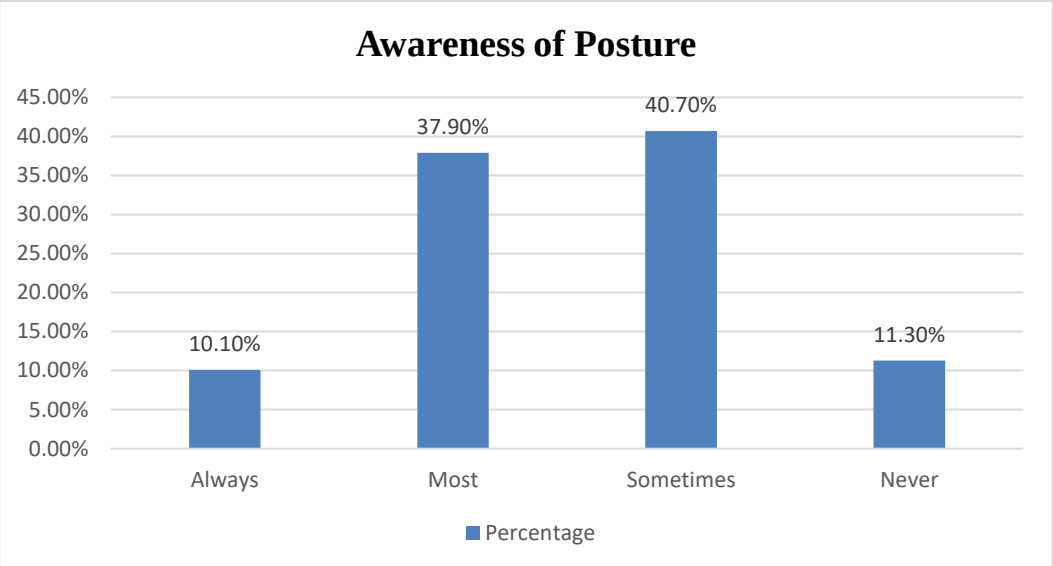

Table 21. Distribution of participants according to Use of Ergonomic chair (n=467)		
Ergonomic chair	**Frequency**	**Percentage**
Yes	199	42.6%
No	268	57.4%
Total	**467**	**100%**

Among the 467 participants, 42.6% reported using ergonomic chairs in their daily practice, which is less than half of the total participants. In contrast, the majority, 57.4%, did not use ergonomic chairs.

Figure 21. Distribution of participants according to Use of Ergonomic chair (n=467)

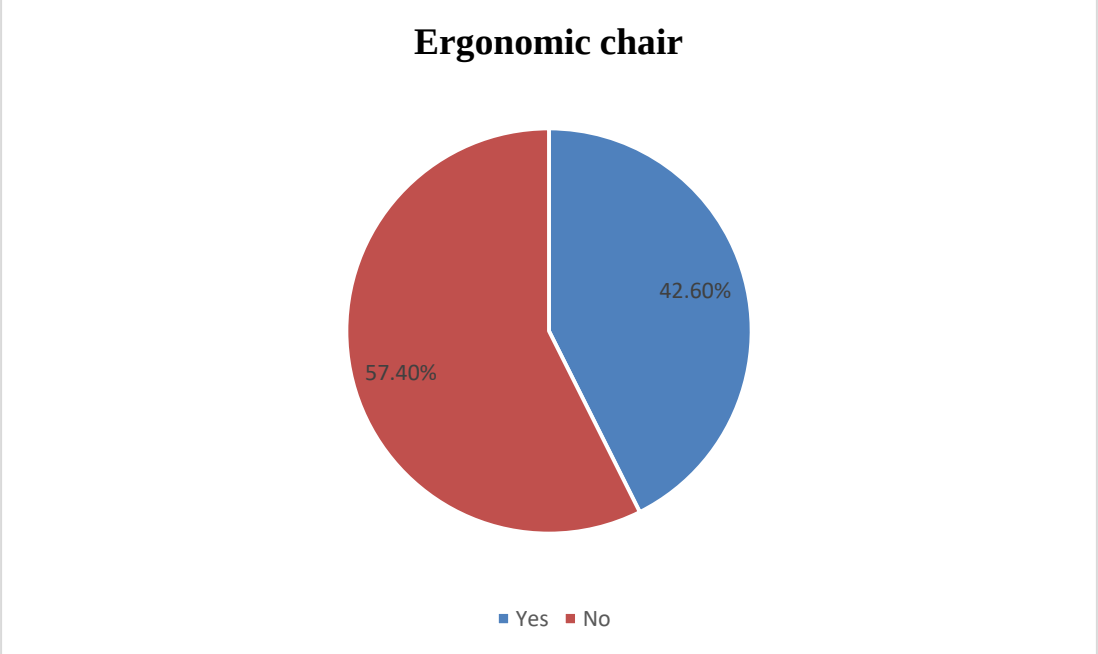

Table 22. Distribution of participants according to Rating of posture (n=467)		
Rate your posture	**Frequency**	**Percentage**
Very good	27	5.8%
Good	227	48.6%
Average	163	34.9%
Poor	50	10.7%
Total	**467**	**100%**

Out of the 467 participants, a small fraction, 5.8%, perceived their posture as very good. The majority, 48.6%, viewed their posture as good. A significant number, 34.9%, described their posture as average, while 10.7% assessed it as poor.

Figure 22. Distribution of participants according to Rating of posture (n=467)

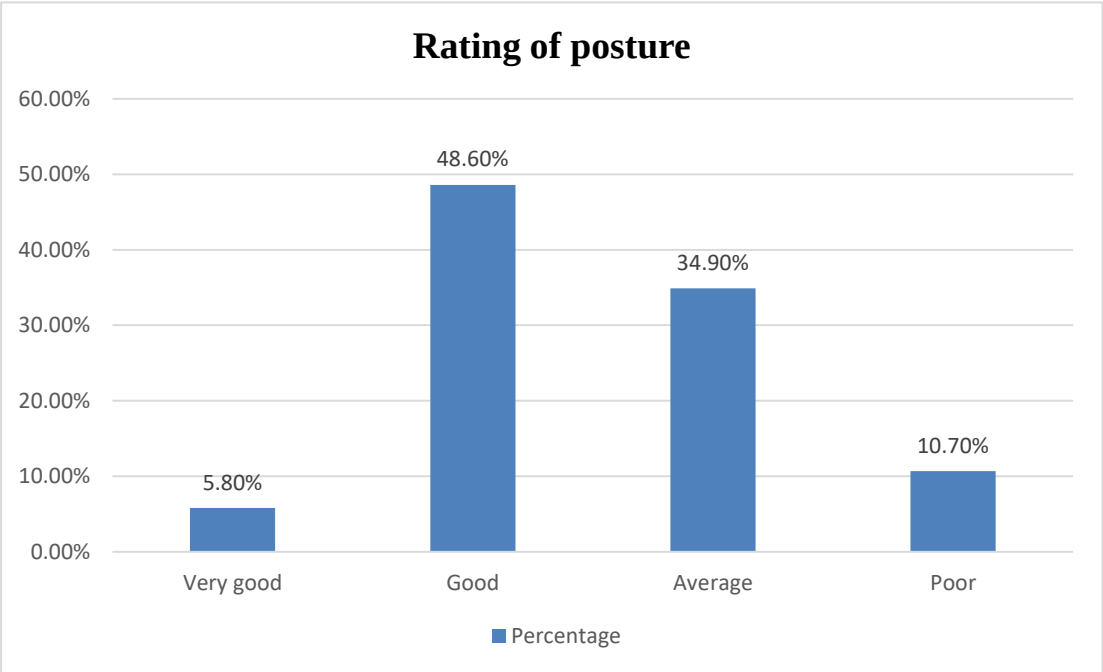

Table 23. Distribution of participants according to practicing regular Muscle stretches (n=467)		
Muscle stretches	**Frequency**	**Percentage**
Yes	145	31%
No	322	69%
Total	**467**	**100%**

Among the 467 participants, 31% reported regularly practicing muscle stretches. In contrast, a substantial majority, 69%, stated that they do not engage in regular muscle stretching.

Figure 23.Distribution of participants according to practicing regular Muscle stretches (n=467)

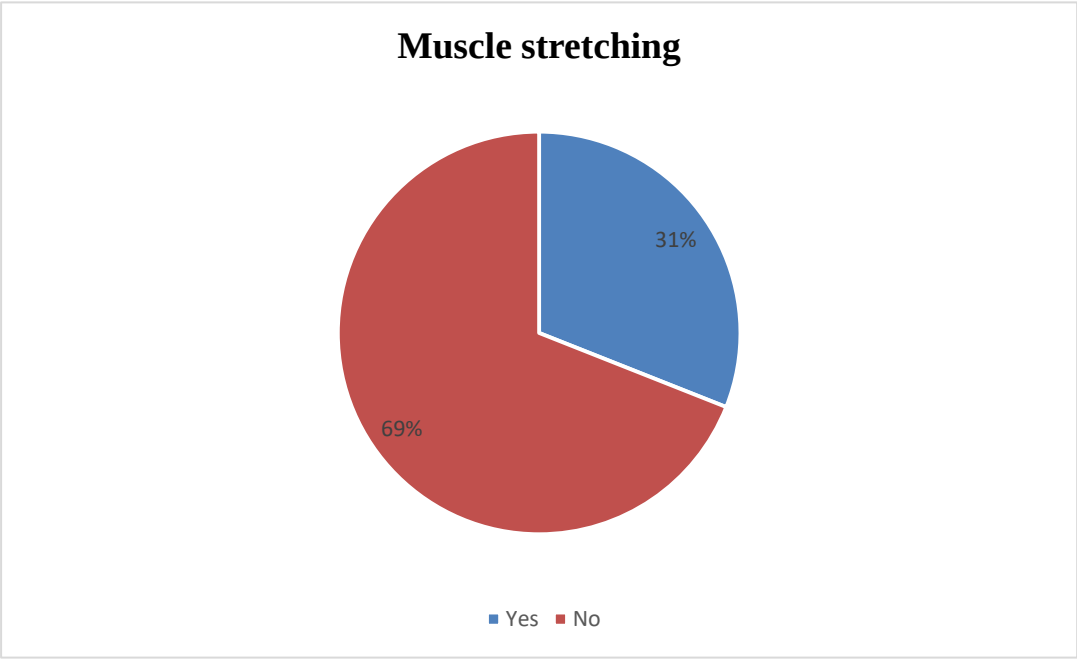

Table 24. Distribution of participants according to Training regarding ergonomics while studying at university (n=467)		
Training regarding ergonomics	**Frequency**	**Percentage**
Yes	193	41.3%
No	274	58.7%
Total	**467**	**100%**

Among the 467 participants, the distribution of those who received training regarding ergonomics during their university studies showed that 41.3% had received such training. In contrast, a larger proportion, 58.7%, reported not having received any training on ergonomics while at university.

Figure 24. Distribution of participants according to Training regarding ergonomics while studying at university (n=467)

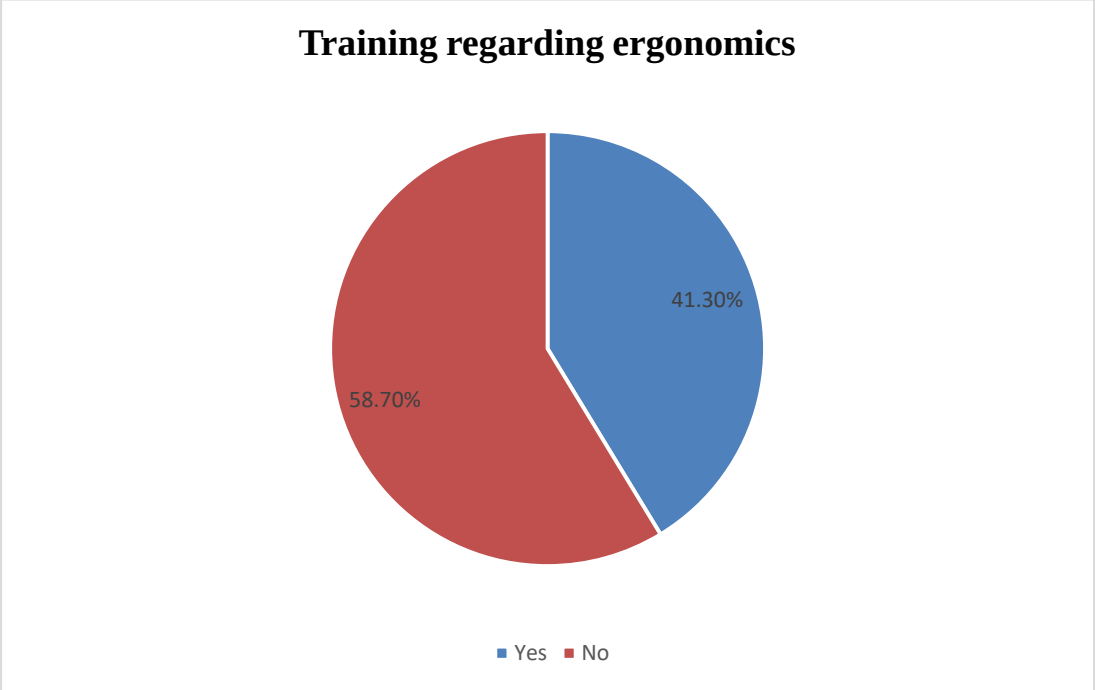

Table 25. Distribution of participants according to no of days of exercise each week (n=467)		
Exercise	**Frequency**	**Percentage**
Everyday	96	20.6%
5 to 6	49	10.5%
3 to 4	82	17.6%
1 to 2	42	9%
Never	198	42.4
Total	**467**	**100%**

Out of 467 participants, a significant portion, 42.4%, reported never exercising. Among those who do exercise, 20.6% engage in physical activity every day, while others exercise less frequently: 10.5% exercise five to six times a week, 17.6% three to four times, and 9% one to two times. This suggests that a substantial number of participants lead relatively sedentary lifestyles, with a smaller but consistent group maintaining regular exercise habits.

Figure 25. Distribution of participants according to duration of exercise each week (n=467)

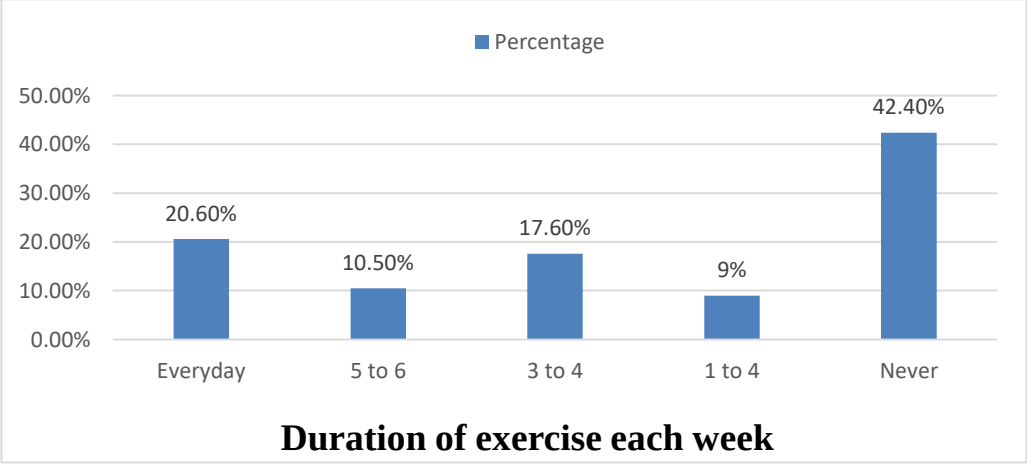

Table 26. Distribution of participants according to duration of exercise each week(n=269)		
Hours of exercise	**Frequency**	**Percentage**
1-2	255	94.8%
2-4	5	2.3%
4-6	9	3%
.>7	0	0
Total	**269**	**100%**

Among the 269 participants, the distribution of the duration of exercise per week showed that the vast majority, 94.8%, exercised for between 1 and 2 hours. A small proportion, 2.3%, exercised for 2-4 hours, while 3% exercised for 4-6 hours. No participants reported exercising more than 7 hours per week.

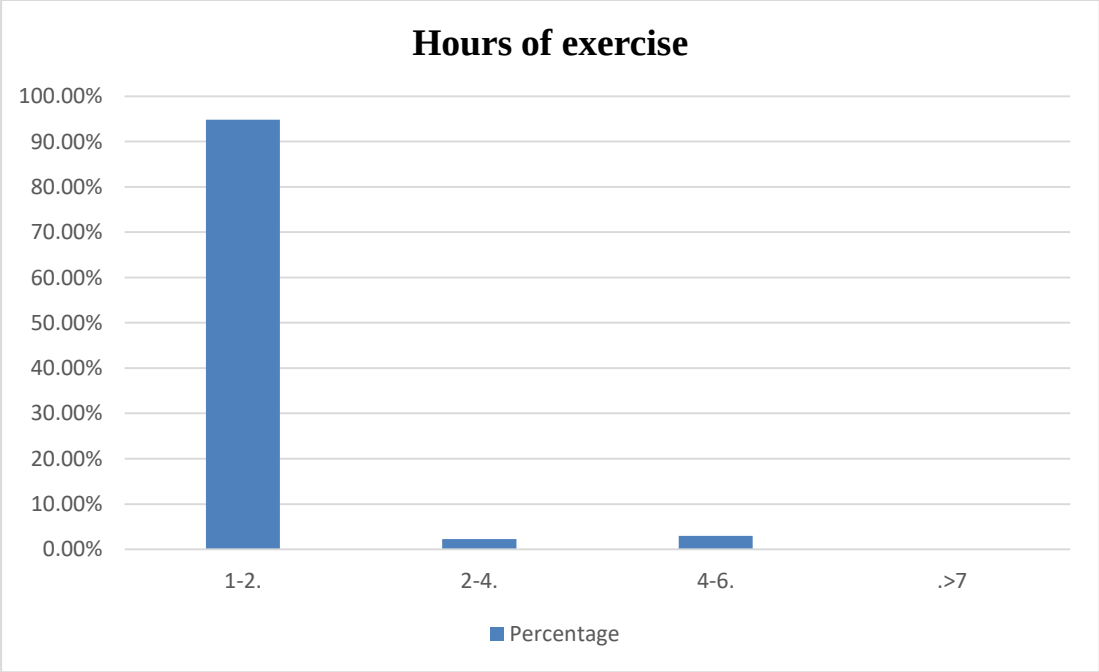

Table 27. Distribution of participants according to presence of medical condition limiting to undertake exercise (n=467)

Medical condition	Frequency	Percentage
Yes	30	6.4%
No	437	93.6%
Total	**467**	**100%**

Out of 467 participants, only 6.4% reported having a medical condition that restricts their exercise activities, while a vast majority, 93.6%, indicated that they do not have such conditions.

Figure 27. Distribution of participants according to presence of medical condition limiting to undertake exercise (n=467)

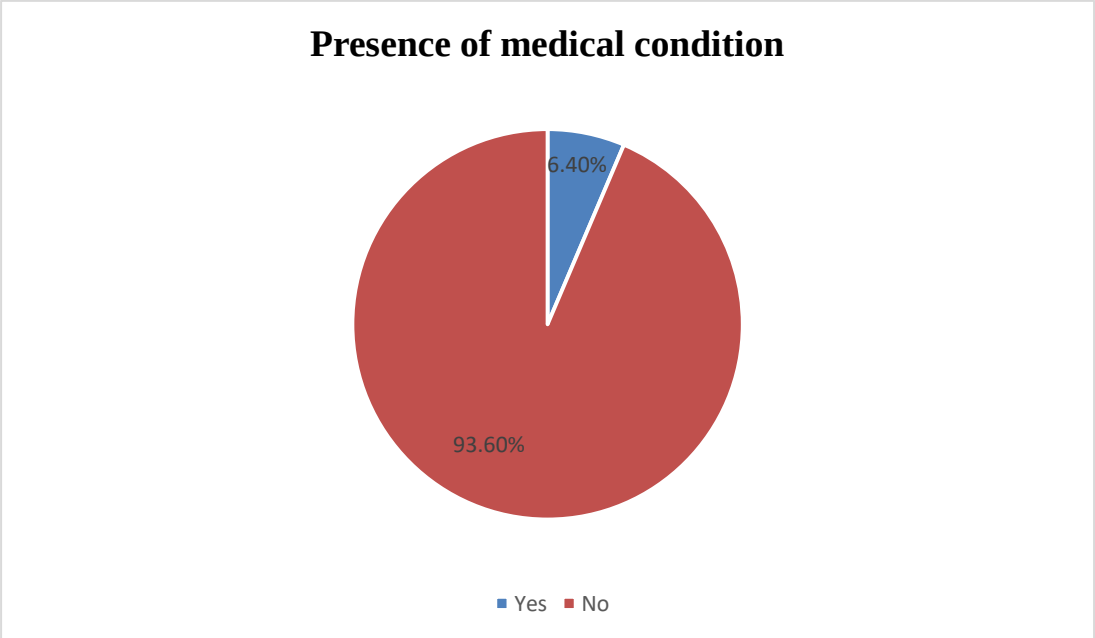

Table 28. Distribution of participants according to practicing any form of meditation or relaxation therapy (n=467)		
Meditation	**Frequency**	**Percentage**
Yes	141	30.2%
No	326	69.8%
Total	**467**	**100%**

Among the 467 participants, 30.2% reported practicing some form of meditation or relaxation therapy. In contrast, the majority, 69.8%, did not engage in such practices.

Figure 28. Distribution of participants according to practicing any form of meditation or relaxation therapy (n=467)

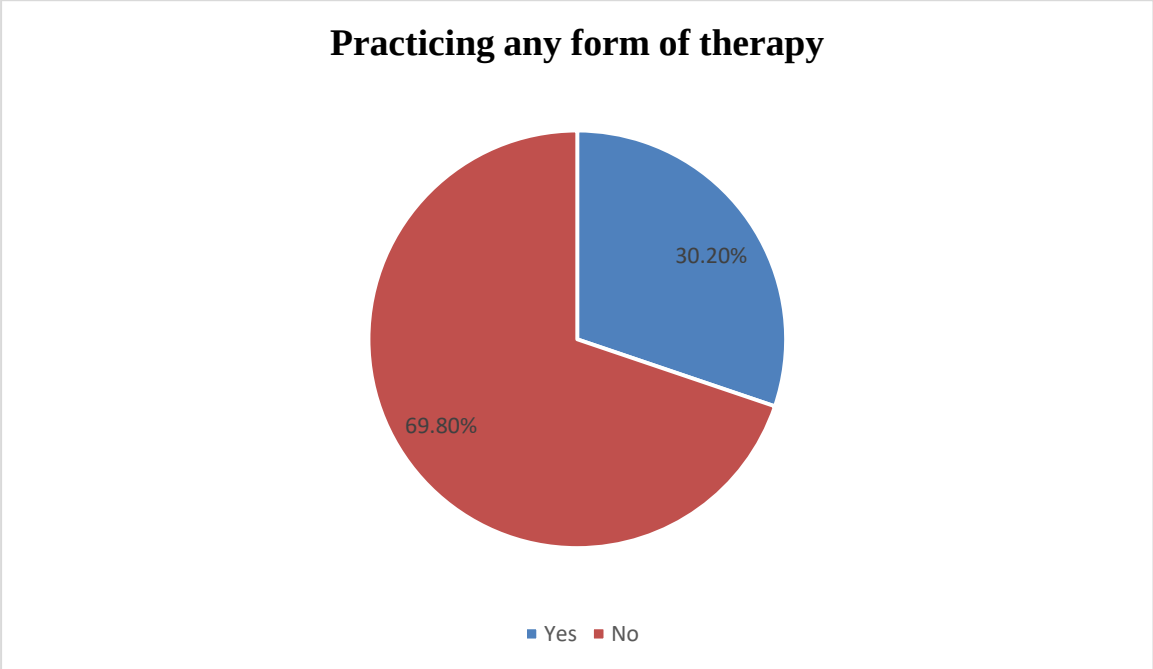

Table 29. Distribution of participants according to practicing any form of protocol been implemented at work place to reduce WMSDs (n=467)		
Current protocol	**Frequency**	**Percentage**
Yes	47	10%
No	420	90%
Total	**467**	**100%**

Out of 467 participants, only 10% reported that their workplace has implemented protocols to reduce WMSDs, while a significant majority, 90%, indicated that no such protocols are in place.

Figure 29. Distribution of participants according to practicing any form of protocol been implemented at work place to reduce WMSDs (n=467)

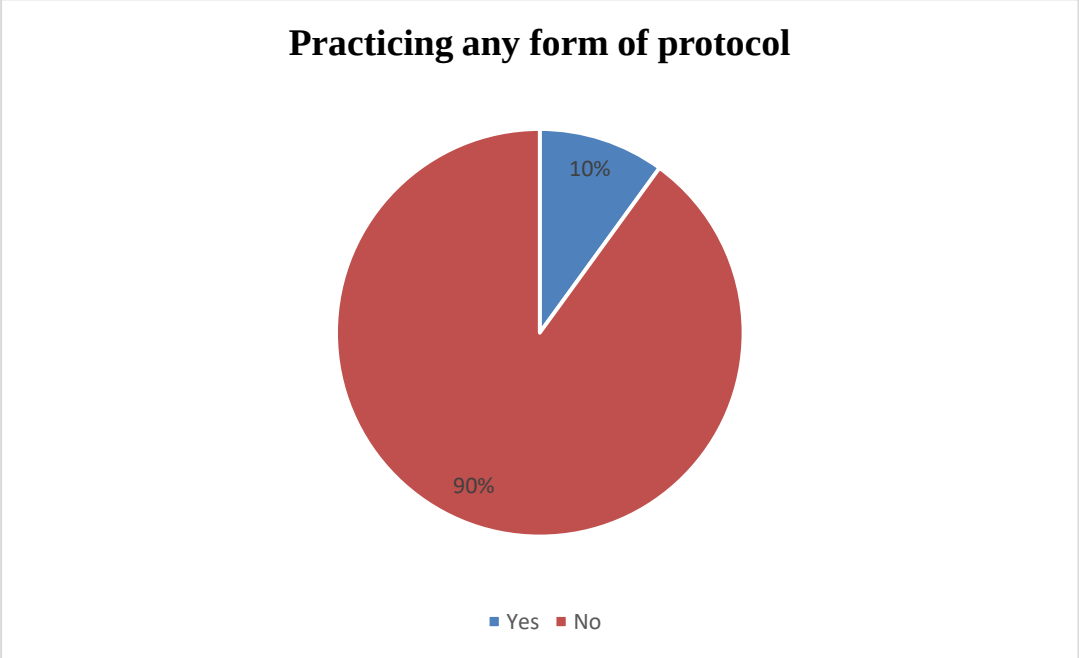

Table 30. Distribution of participants based on perception that protocol implemented has improved the ergonomics of work environment (n=467)

Protocol implemented	Frequency	Percentage
Great	23	4.9%
Slight	44	9.4%
No	13	2.8%
Unsure	387	82.9%
Total	**467**	**100%**

Out of 467 participants, a small percentage felt that the protocols have greatly improved ergonomics 4.9%, while 9.4% noted a slight improvement. However, the majority of participants were unsure about the impact of these protocols, with 82.9% expressing uncertainty. Additionally, only a small number 2.8% reported no improvement.

Figure 30. Distribution of participants based on perception that protocol implemented has improved the ergonomics of work environment (n=467)

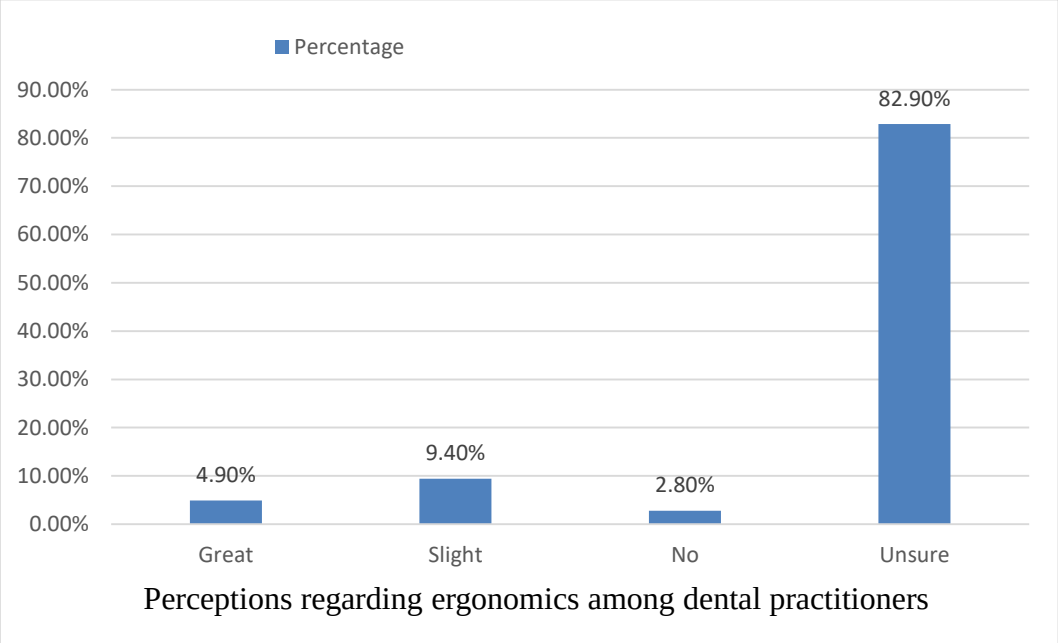

Table 31. Distribution of participants according to the perception that training regarding ergonomics in work place would be useful (n=467)		
Training useful	**Frequency**	**Percentage**
Yes	375	80.3%
No	92	19.7%
Total	**467**	**100%**

Out of 467 participants, a significant majority, 80.3%, believed that such training would be useful. In contrast, 19.7% did not see the value in ergonomic training.

Table 31. Distribution of participants according to the perception that training regarding ergonomics in work place would be useful (n=467)

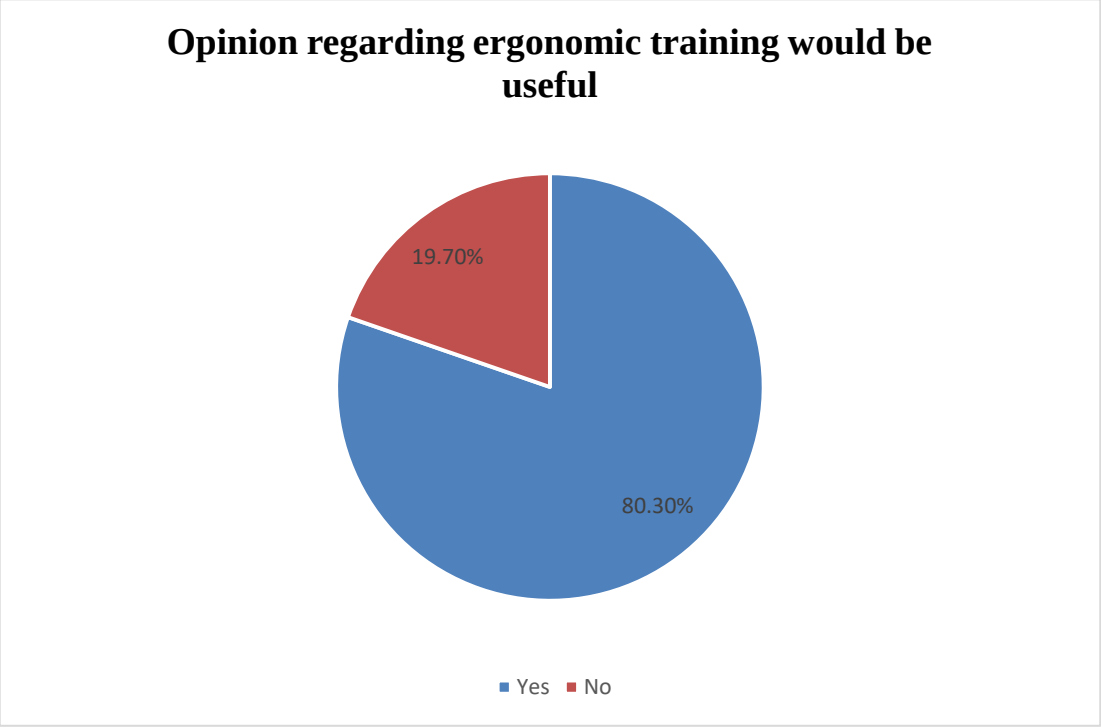

Table 32. Distribution of participants according to alcohol consumption (n=467)		
Alcohol consumption	**Frequency**	**Percentage**
Yes	91	19.5%
No	376	80.5%
Total	**467**	**100%**

Out of 467 participants, 19.5% reported consuming alcohol, while a significant majority, 80.5%, did not consume alcohol

Figure 32. Distribution of participants according to alcohol consumption (n=467)

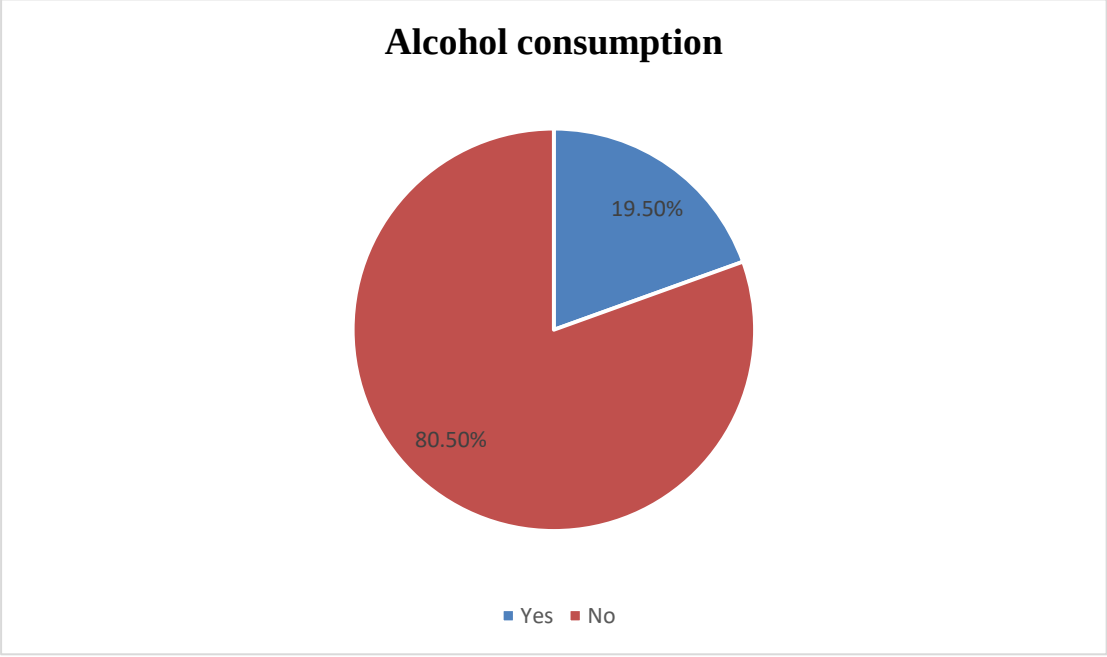

Table 33. Distribution of participants according to amount of alcohol consumption (n=467)

Amount of alcohol (in ml)	Frequency	Percentage
180	7	1.6%
90	1	0.2%
60	1	0.2%
30	82	17.5%
Non-Alcoholic	376	80.5%
Total	**467**	**100%**

Among the 467 participants, the distribution of alcohol consumption showed that the majority, 80.5%, were non-alcoholic. A significant proportion, 17.5%, consumed 30 units of alcohol. A very small percentage consumed higher amounts: 1.6% consumed 180 units, and 0.2% each consumed 90 and 60 units, respectively.

Figure 33. Distribution of participants according to amount of alcohol consumption (n=467)

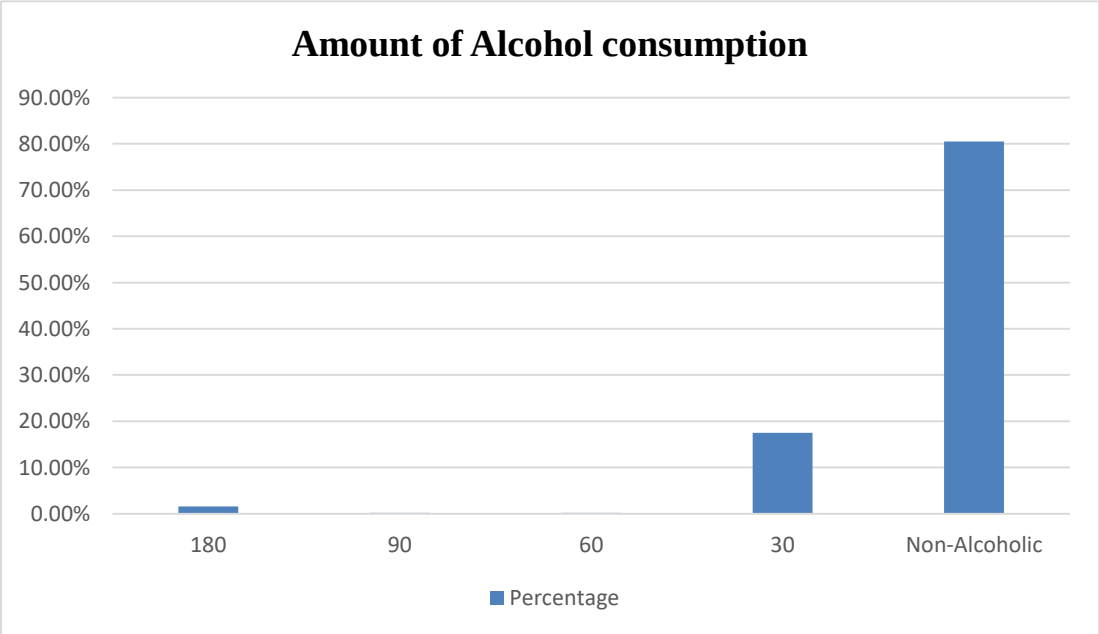

Table 34. Distribution of participants according to Frequency of alcohol consumption (n=467)		
Frequency of Alcohol consumption	**Frequency**	**Percentage**
Everyday	17	3.6%
Week	17	3.6%
Month	18	3.9%
Occasional	39	8.3%
Non-Alcoholic	376	80.6%
Total	**467**	**100%**

Among the 467 participants, the distribution of the frequency of alcohol consumption revealed that the majority, 80.6%, were non-alcoholic. A small proportion consumed alcohol occasionally, with 8.3% drinking occasionally. The remaining participants consumed alcohol more regularly 3.6% consumed every day, another 3.6% consumed weekly, and 3.9% consumed monthly.

Figure 34. Distribution of participants according to Frequency of alcohol consumption

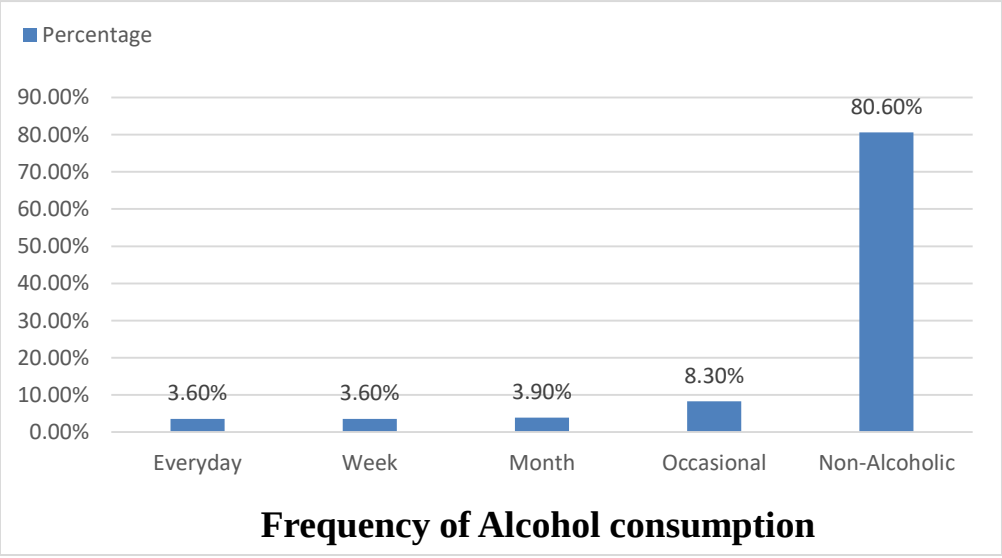

Table 35. Distribution of participants according to Tobacco habit (n=467)		
Tobacco usage	**Frequency**	**Percentage**
Yes	48	10.3%
No	419	89.7%
Total	**467**	**100%**

Among the 467 participants, the distribution of tobacco usage showed that the majority, 89.7%, did not use tobacco. In contrast, a smaller proportion, 10.3%, reported using tobacco.

Figure 35. Distribution of participants according to Tobacco habit (n=467)

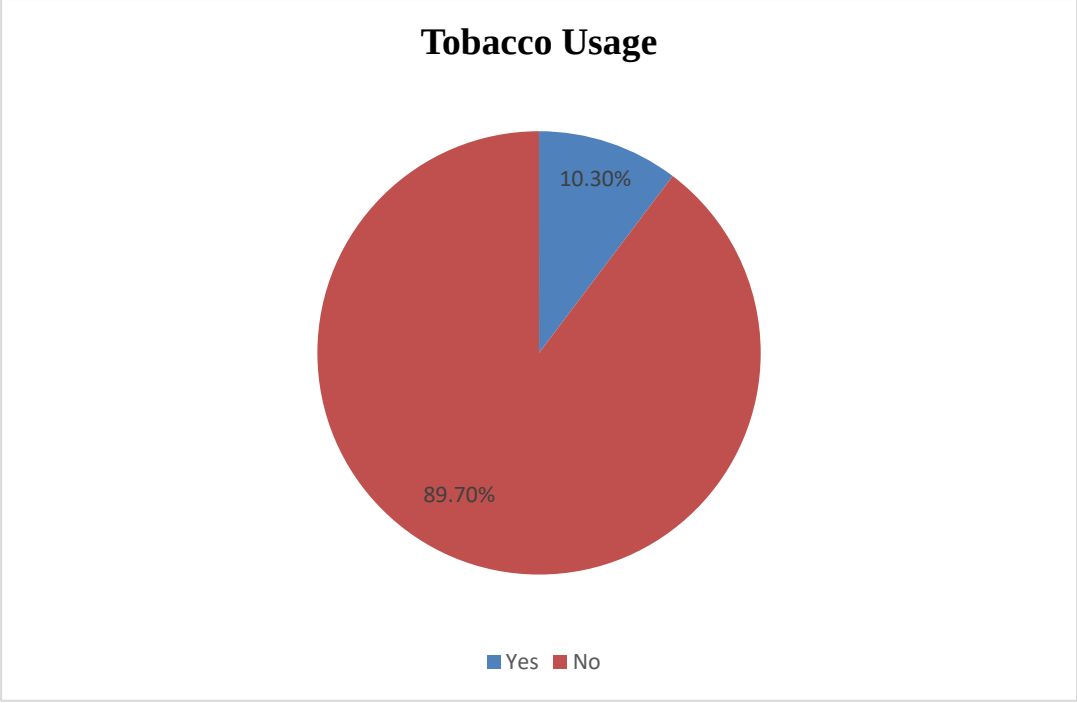

Table 36. Distribution of participants according to Type of tobacco habit (n=467)		
Type of tobacco	**Frequency**	**Percentage**
Smoking	40	9.5%
Smokeless	7	0.6%
Combine	1	0.2%
Non-consumers	419	89.7%
Total	**467**	**100%**

Among the 467 participants, the distribution of tobacco usage habits showed that 9.5% were smokers, 0.6% used smokeless tobacco, and 0.2% used both smoking and smokeless tobacco. The majority, 89.7%, did not consume tobacco.

Figure 36. Distribution of participants according to Type of tobacco habit

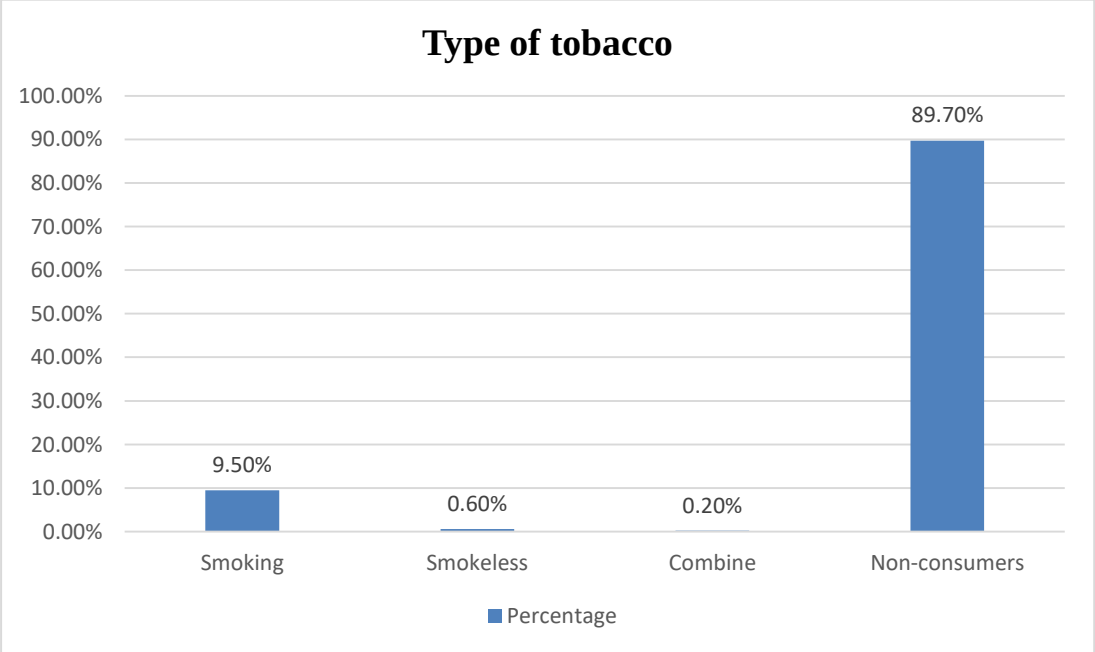

Table 37. Distribution of participants according to BMI (n=467)		
Variable	**Frequency**	**Percentage**
Underweight	9	1.9%
Normal	234	50.1%
Overweight	183	39.2%
Obese	41	8.8%
Total	**467**	**100%**

Among the 467 participants, the distribution according to Body Mass Index (BMI) revealed that the majority, 50.1%, fell into the normal weight category. This was followed by 39.2% of participants who were classified as overweight, while 8.8% were categorized as obese. A small proportion, 1.9%, were underweight. These findings indicate that a significant portion of the study population had a BMI within the normal range, though a considerable percentage were either overweight or obese.

Figure 37. Distribution of participants according to BMI

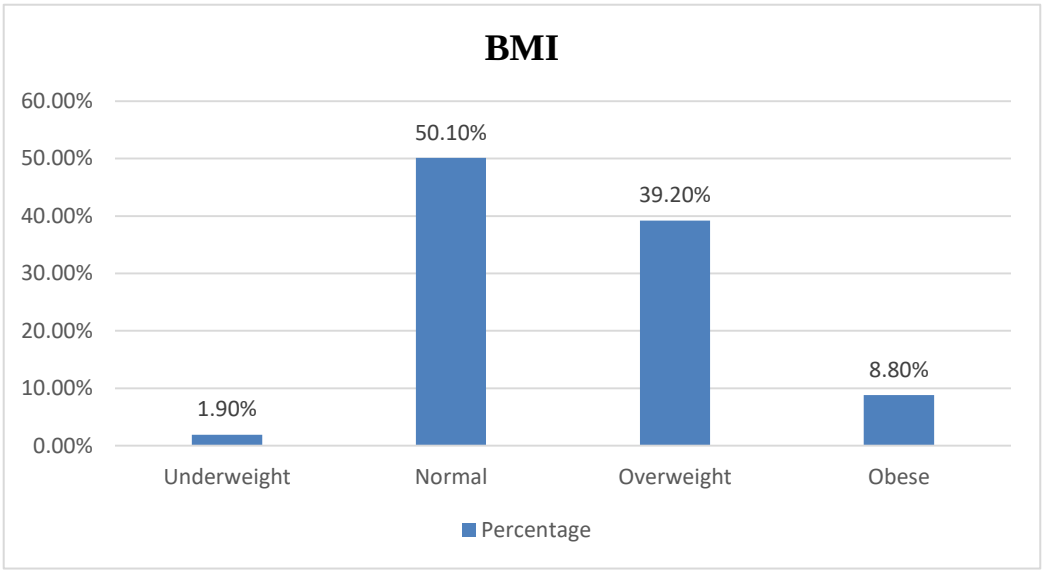

Table 38. Distribution of participants according to presence of Musculoskeletal pain (n=467)		
No of people experiencing Musculoskeletal pain	**Frequency**	**Percentage**
Yes	427	91.4%
No	40	8.6%
Total	**467**	**100%**

Among the 467 participants, the distribution according to the presence of musculoskeletal pain revealed that the vast majority 91.4%, reported experiencing musculoskeletal pain. In contrast, only 8.6% of participants reported no musculoskeletal pain. These findings highlight that musculoskeletal pain is highly prevalent among the study population, affecting nearly all participants.

Figure 38. Distribution of participants according to presence of Musculoskeletal pain

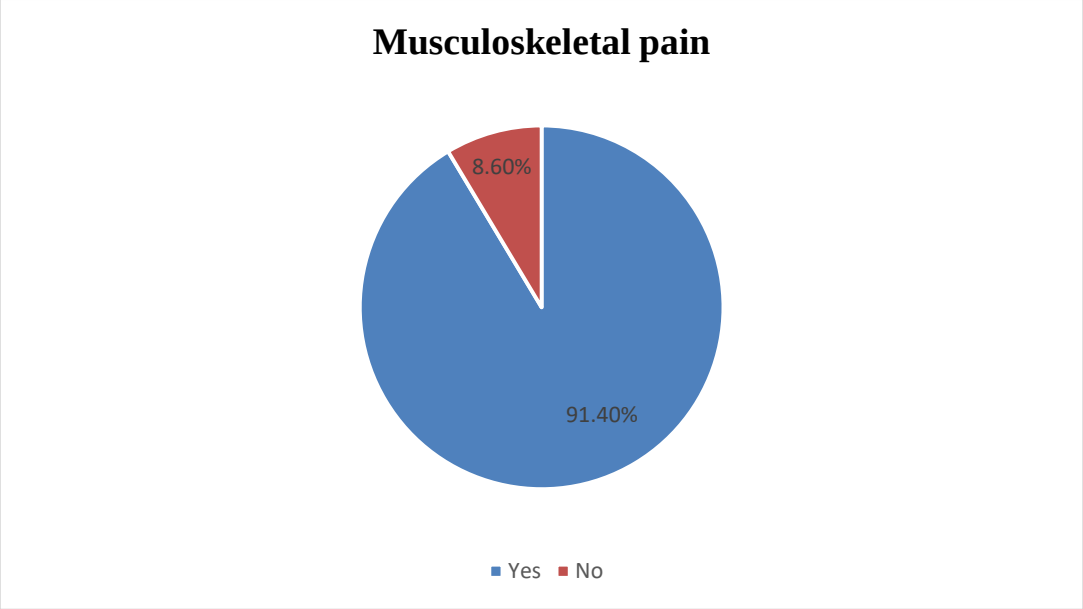

Table 39. Distribution of Musculoskeletal pain according to the anatomical site (n=427)		
Anatomical site	**Frequency**	**Percentage**
Neck	163	38.2%
Shoulders	103	24.1%
Upper back	90	21.5%
Elbows	69	16.2%
Wrist and hand	81	18.9%
Lower back	150	35.1%
Hip and thighs	45	10.5%
Knees	61	14.3%
Elbows and feet	41	9.6%

Among 427 respondents revealed varying prevalence across different anatomical sites. The neck was the most commonly affected area, reported by 38.2% of participants, followed closely by the lower back at 35.1%. Shoulders and upper back were also frequently affected, accounting for 24.1% and 21.5% of cases, respectively. Wrist and hand disorders were reported by 18.9%, while elbow-related issues were noted in 16.2% of respondents. Knee complaints were reported by 14.3%, whereas hip and thigh disorders were less common 10.5%. The least prevalent site was elbows and feet, with only 9.6% of participants reporting issues in these areas. These findings highlight the neck and lower back as the most significant sites of WMSDs, emphasizing the need for targeted ergonomic interventions in these regions.

Figure 39 . Distribution of Musculoskeletal pain according to the anatomical site (n=427)

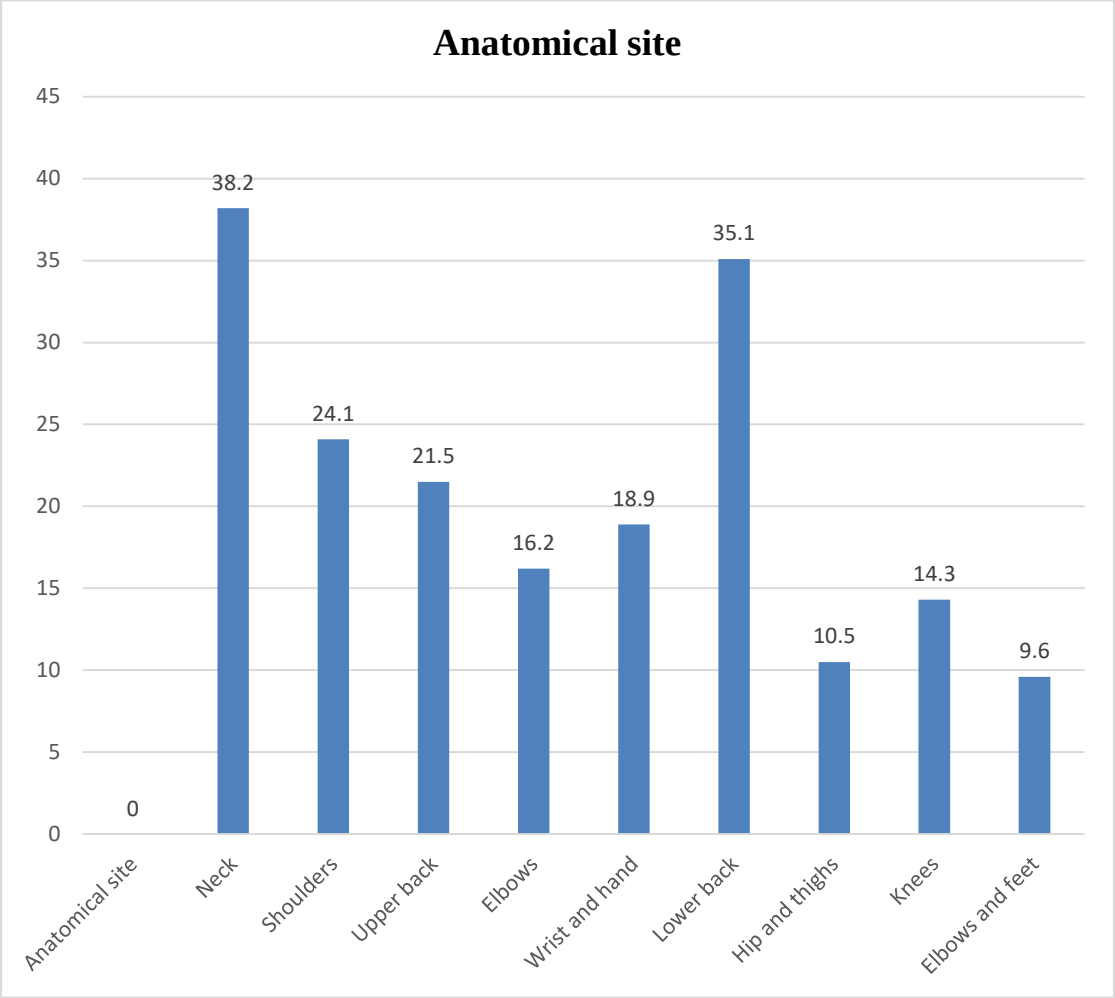

Table 40. Distribution of Musculoskeletal pain according to Education (n=427)		
Education	**Yes**	**%**
Prosthodontics & Crown Bridge	29	6.7%
Oral Medicine and Radiology	17	4.2%
Paedodontics & Preventive Dentistry	8	1.9%
Public Health Dentistry	16	3.7%
Oral &, Maxillofacial Pathology & Oral Microbiology,	19	4.5%
Orthodontics & Dentofacial Orthopaedics,	29	6.7%
Conservative Dentistry & Endodontics,	23	5.3%
Oral & Maxillofacial Surgery,	30	7%
Periodontology	25	5.8%
BDS	231	54.2%
Total	**427**	**100%**

Among 427 respondents reporting pain were mainly general dentists (BDS), accounting for 54.2% of the total. Among specialists, those in Oral & Maxillofacial Surgery reported the highest prevalence at 7%, followed by Prosthodontics & Crown Bridge and Orthodontics & Dentofacial Orthopaedics, each at 6.7%. Periodontology specialists reported musculoskeletal pain in 5.8% of cases, while Conservative Dentistry & Endodontics accounted for 5.3%. Lower frequencies

were observed in Oral & Maxillofacial Pathology & Oral Microbiology 4.5%, Oral Medicine and Radiology 4.2%, Public Health Dentistry 3.7%, and Pedodontics & Preventive Dentistry 1.9%. These findings suggest that musculoskeletal pain is prevalent across all dental disciplines, with general dentists and certain specialists (e.g., oral surgeons, prosthodontists, and orthodontists) being particularly affected. This may reflect differences in clinical postures, workload, and ergonomic practices among specialties.

Figure 40. Distribution of Musculoskeletal pain according to Education (n=427)

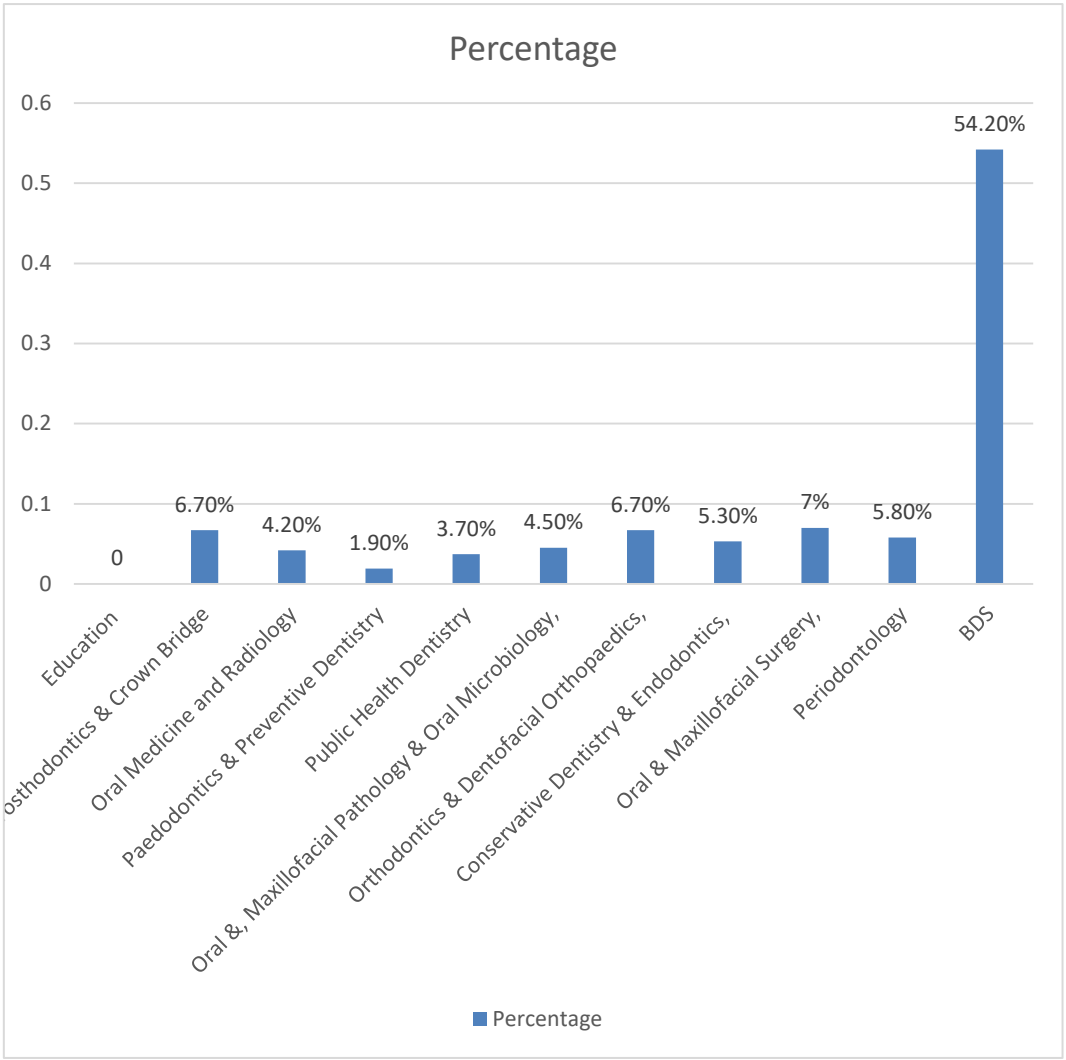

Table 41. Association of WMSDs with Age (n=427)					
Age (years)	**Musculoskeletal Pain**				
	Yes	**%**	**No**	**%**	**Total**
≤25	37	86.0	6	14	43
25 to 34	134	97.1	4	2.9	138
35 to 44	89	90.8	9	9.2	98
45 to 54	92	81.4	21	18.6	113
≥55	75	100	0	0	75
Total	**427**	**91.4**	**40**	**8.6**	**467**
χ^2= 29.26			**p-value <0.0001***		

The association between age and musculoskeletal pain was found to be statistically significant ($p<0.0001$). Among the 467 participants, the prevalence of pain varied across age groups. In the ≤25 years age group, 86.0% reported experiencing pain. In the 25 to 34 years group, the prevalence of pain was even higher, with 97.1% reporting pain, for participants aged 35 to 44 years, 90.8% reported pain. In the 45 to 54 years group, 81.4% experienced pain and Notably in the ≥55 years age group, 100% of participants reported musculoskeletal pain. These findings highlight that musculoskeletal pain is highly prevalent across all age groups, with the burden increasing significantly with age, particularly among those aged ≥55 years, where pain is universal.

Table 42. Association of WMSDs with Gender					
Gender	**Musculoskeletal Pain**				
	Yes	**%**	**No**	**%**	**Total**
Male	193	91.5	18	8.5	211
Female	234	91.4	22	8.6	256
Total	**427**	**91.4**	**40**	**8.6**	**467**
χ^2= 0.0013			**p-value= 0.971**		

The association between gender and musculoskeletal pain was analysed, and no statistically significant association was found (p=0.971). Among the 467 participants, 91.5% of males and 91.4 % of females reported experiencing musculoskeletal pain. Conversely, 3.9% of males and 4.7% of females reported no pain. The chi-square test yielded a value of $\chi^2 = 0.0013$, indicating that the distribution of pain was similar across both genders. These findings suggest that musculoskeletal pain is equally prevalent among males and females, with no significant difference based on gender.

Table 43. Association of WMSDs with according to BMI (n=467)					
BMI	**Musculoskeletal Pain**				
	Yes	**%**	**No**	**%**	**Total**
Under weight	9	100	0	0	9
Normal	210	89.7	24	10.3	234
Overweight	172	94.0	11	6.0	183
obesity	36	87.8	5	12.2	41
Total	**427**	**91.4**	**40**	**8.6**	**467**
χ 2 = 3.91			**p-value = 0.271**		

The association between BMI and musculoskeletal pain was analysed, Among the 467 participants, the prevalence of pain varied across BMI categories. In the underweight group, 100% reported experiencing pain, with none being pain-free. For those with normal weight, 89.7% reported pain, while among overweight individuals, 94.0% reported pain and in the obesity category, 87.8% reported pain. and no statistically significant association was found (p=0.271). The chi-square test yielded a value of $\chi^2 = 3.91$, indicating that the distribution of pain did not significantly differ across BMI categories. These findings suggest that musculoskeletal pain is prevalent across all BMI groups, with no significant variation based on weight status.

Table 44. Association of WMSDs with Education					
Education	**Musculoskeletal Pain**				
	Yes	**%**	**No**	**%**	**Total**
BDS	231	86.8	35	13.2	266
MDS	196	97.5	5	2.5	201
Total	**427**	**91.4**	**40**	**8.6**	**467**
χ^2= 16.37 p-value= < 0.001*					

The association between education and musculoskeletal pain was found to be statistically significant ($p<0.001$). Among the 467 participants, 86.8% of those with a BDS degree reported experiencing pain. In contrast, 97.5% of those with an MDS degree reported pain. The chi-square test yielded a value of $\chi^2 = 16.37$, indicating a significant difference in the distribution of pain based on educational level. These findings suggest that individuals with a BDS degree are more likely to report musculoskeletal pain compared to those with an MDS degree.

Table 45. Association of WMSDs according to Specialty

Specialty	Musculoskeletal Pain				
	Yes	**%**	**No**	**%**	**Total**
Prosthodontics & Crown Bridge	29	96.7	1	3.3	30
Oral Medicine and Radiology	17	94.4	1	5.6	18
Pedodontics & Preventive Dentistry	8	100	0	0	8
Public Health Dentistry	16	94.1	1	5.9	17
Oral &, Maxillofacial Pathology & Oral Microbiology,	19	100	0	0	19
Orthodontics & Dentofacial Orthopaedics,	29	100	0	0	29
Conservative Dentistry & Endodontics,	23	100	0	0	23
Oral & Maxillofacial Surgery,	30	93.8	2	6.2	32
Periodontology	25	100	0	0	25
Total	**196**	**97.5**	**5**	**2.5**	**201**
χ^2 6.14 p-value= 0.63					

The association between specialty and musculoskeletal pain was analysed, among the 201 participants, the prevalence of pain was high across all specialties. For instance, in Prosthodontics & Crown Bridge, 96.7% reported pain. Similarly, in Oral Medicine and Radiology, 94.4% reported pain, In Oral & Maxillofacial Surgery, 93.8% reported pain, with Other specialties, such as Orthodontics & Dentofacial Orthopaedics, Conservative Dentistry & Endodontics, Periodontology and pedodontics , reported 100% prevalence of pain among their participants, and no

statistically significant association was found (p=0.63), the chi-square test yielded a value of $\chi^2 = 6.14$, indicating that the distribution of pain did not significantly differ across specialties. These findings suggest that musculoskeletal pain is highly prevalent across all specialties, with no significant variation based on the field of practice.

Table 46. Association of WMSDs with Hand dominance

Hand dominance	Musculoskeletal Pain				
	Yes	**%**	**No**	**%**	**Total**
Right hand	372	90.7	38	9.3	410
Left hand	55	96.5	2	3.5	57
Total	**427**	**91.4**	**40**	**8.6**	**467**
χ2= 2.11 p-Value = 0.146					

The association between hand dominance and musculoskeletal pain was analysed, and no statistically significant association was found (p=0.146). Among the 467 participants, 90.7% of right-handed individuals reported experiencing pain, for left-handed individuals, 96.5% reported pain, The chi-square test yielded a value of $\chi^2 = 2.11$, indicating that the distribution of pain did not significantly differ based on hand dominance. These findings suggest that musculoskeletal pain is prevalent among both right-handed and left-handed individuals, with no significant difference between the two groups.

Table 47 . Association of WMSDs with according to Years of practicing dentistry					
Years of practice	**Musculoskeletal Pain**				
	Yes	**%**	**No**	**%**	**Total**
<5	93	83.0	19	17.0	112
5-10	121	89.6	14	10.3	135
11-15	95	96.0	4	4.0	99
>15	118	97.5	3	2.5	121
Total	**427**	**91.4**	**40**	**8.6**	**467**
χ2=19.25			**p-Value= 0.0002***		

The association between years of practicing dentistry and musculoskeletal pain was found to be statistically significant (p=0.0002). Among the 467 participants, the prevalence of pain varied across experience levels. For those with <5 years of experience, 83.0% reported pain, while in the 5-10 years of experience group 89.6% reported pain, and those with 11-15 years of experience 95.9% reported pain, for participants with >15 years of experience, 97.5% reported pain, The chi-square test yielded a value of $\chi^2 = 19.25$, indicating a significant difference in the distribution of pain based on years of practice. These findings suggest that the prevalence of musculoskeletal pain increases with years of experience, with the highest burden observed among those with >15 years of practice.

Table 48. Association of WMSDs with according to posture at work					
Posture at work	**Musculoskeletal Pain**				
	Yes	**%**	**No**	**%**	**Total**
Seated	52	96.3	2	3.7	54
Mostly seated	254	91.4	24	8.6	278
Mostly standing	102	89.5	12	10.5	114
Standing	19	90.5	2	9.5	21
Total	**427**	**91.4**	**40**	**8.6**	**467**
χ2= 2.19 p Value = 0.53					

The association between posture at work and musculoskeletal pain was analysed, and no statistically significant association was found (p=0.53). Among the 467 participants, the prevalence of pain varied across different postures. For those who worked in a seated posture, 96.3% reported pain. Among those who were mostly seated, 91.4% reported pain. For individuals who were mostly standing, 89.5% reported pain. Finally, among those who worked in a standing posture, 90.5% reported pain. The chi-square test yielded a value of $\chi^2 = 2.19$, indicating that the distribution of pain did not significantly differ based on posture at work. These findings suggest that musculoskeletal pain is prevalent across all postures, with no significant variation based on working posture.

Table 49. Association of WMSDs with according to Hours of working in Dental practice (n=467)

Hours at work	Musculoskeletal Pain				
	Yes	**%**	**No**	**%**	**Total**
<3hrs	13	34.2	25	65.8	38
3-6	188	99.5	1	0.5	189
>6hrs	226	94.2	14	5.8	240
Total	**427**	**91.4**	**40**	**8.6**	**467**
χ2 = 178.4			**p-Value = < 0.0001***		

The association between hours of working in dental practice and musculoskeletal pain was found to be statistically significant ($p<0.0001$). Among the 467 participants, the prevalence of pain varied significantly based on working hours. For those working <3 hours/day, 34.2% reported pain. Among those working 3-6 hours/day, 99.5% reported pain. For individuals working >6 hours/day, 94.2% reported pain. The chi-square test yielded a value of $\chi^2 = 178.4$, indicating a significant difference in the distribution of pain based on working hours. These findings suggest that individuals working 3-6 hours/day have the highest prevalence of pain, followed by those working >6 hours/day, while those working <3 hours/day have the lowest prevalence of pain.

Table 50. Association of WMSDs and consumption of alcohol (n=467)					
Habits	**Musculoskeletal Pain**				
	Yes	**%**	**No**	**%**	**Total**
Alcoholics	85	93.4	6	6.6	91
Non-alcoholics	342	91.0	34	9.0	376
Total	**427**	**91.4**	**40**	**8.6**	**467**
$\chi 2 = 0.57$			**p-Value = 0.45**		

The association between alcohol consumption and musculoskeletal pain was analysed, and no statistically significant association was found (p=0.45). Among the 467 participants, 93.4% of alcohol consumers reported experiencing pain, while 91% of non-alcohol consumers reported pain. The chi-square test yielded a value of $\chi^2 = 0.57$, indicating that the distribution of pain did not significantly differ based on alcohol consumption. These findings suggest that musculoskeletal pain is prevalent among both alcohol consumers and non-consumers, with no significant difference between the two groups

Table 51. Association of WMSDs and consumption of tobacco (n=467)					
Habits	**Musculoskeletal Pain**				
	Yes	**%**	**No**	**%**	**Total**
Tobacco consumers	43	89.6	5	10.4	48
Tobacco non-consumers	384	91.6	35	8.4	419
Total	**427**	**91.4**	**40**	**8.6**	**467**
$\chi 2 = 0.24$			**p-Value= 0.62**		

The association between tobacco consumption and musculoskeletal pain was analysed, and no statistically significant association was found (p=0.62). Among the 467 participants, 89.6% of tobacco consumers reported experiencing pain, while 91.6% of non-consumers reported pain. The chi-square test yielded a value of $\chi^2 = 0.24$, indicating that the distribution of pain did not significantly differ based on tobacco consumption. These findings suggest that musculoskeletal pain is prevalent among both tobacco consumers and non-consumers, with no significant difference between the two groups.

Table 52. Association of WMSDs with no of days of exercise each week (n=467)					
Exercise each week	**Musculoskeletal Pain**				
	Yes	**%**	**No**	**%**	**Total**
Everyday	87	90.6	9	9.4	96
5 to 6	36	73.5	13	26.5	49
3 to 4	72	87.8	10	12.2	82
1 to 2	41	97.6	1	2.4	42
Never	191	96.5	7	3.5	198
Total	**427**	**91.4**	**40**	**8.6**	**467**
χ2 30.11			**p-Value = < 0.0001**		

The association between number of days of exercise each week and musculoskeletal pain was found to be statistically significant ($p<0.0001$). Among the 467 participants, the prevalence of pain varied based on exercise frequency. For those who exercised every day, 90.6 reported pain. Among those who exercised 5 to 6 days/week, 73.5% reported pain. For individuals who exercised 3 to 4 days/week, 87.8% reported pain. Among those who exercised 1 to 2 days/week, 97.6% reported pain. Finally, for those who never exercised, 96.5% reported pain. The chi-square test yielded a value of $\chi^2 = 30.11$, indicating a significant difference in the distribution of pain based on exercise frequency. These findings suggest that individuals who exercise 5 to 6 days/week have the lowest prevalence of pain, while those who never exercise or exercise 1 to 2 days/week have the highest prevalence of pain.

Table 53. Univariate Analysis of key variables

Variable	Category	Pain (Yes)	Pain (No)	Odds Ratio (OR)	95% CI for OR	p-value
Age (years)	≤25	37	6	1.00 (Reference)	-	<0.0001*
	25 to 34	134	4	5.43	(1.78, 16.56)	<0.0001*
	35 to 44	89	9	1.63	(0.56, 4.74)	0.37
	45 to 54	92	21	0.72	(0.27, 1.92)	0.51
	≥55	75	0	Undefined	-	<0.0001*
Education	BDS	231	35	1.00 (Reference)	-	<0.001*
	MDS	196	5	6.12	(2.37, 15.81)	<0.001*
Years of Practice	<5	93	19	1.00 (Reference)	-	0.0002*
	5-10	121	14	1.77	(0.84, 3.72)	0.13
	11-15	95	4	4.86	(1.58, 14.96)	0.006*
	>15	118	3	8.03	(2.34, 27.58)	<0.0001*
Hours at Work	<3 hrs	13	25	1.00 (Reference)	-	<0.0001*
	3-6 hrs	188	1	36.92	(4.81, 283.33)	<0.0001*
	>6 hrs	226	14	31.43	(4.16, 237.50)	<0.0001*
Exercise (days/week)	Everyday	87	9	1.00 (Reference)	-	<0.0001*
	5 to 6	36	13	0.29	(0.12, 0.71)	0.007*
	3 to 4	72	10	0.75	(0.30, 1.86)	0.53
	1 to 2	41	1	4.29	(0.52, 35.71)	0.18
	Never	191	7	2.86	(1.07, 7.69)	0.04*

The univariate analysis revealed significant associations between several key variables and the presence of pain. For age, individuals aged 25–34 years had significantly higher odds of pain compared to those ≤25 years (OR = 5.43, 95% CI: 1.78–16.56, $p < 0.0001$), while those aged ≥55 years also showed a significant association with pain, though the odds ratio was undefined due to zero cases in the "No Pain" group. No significant associations were observed for the 35–44 and 45–54 age groups.

Regarding education, individuals with an MDS degree had significantly higher odds of pain compared to those with a BDS degree (OR = 6.12, 95% CI: 2.37–15.81, $p < 0.001$). For years of practice, practitioners with 11–15 years (OR = 4.86, 95% CI: 1.58–14.96, $p = 0.006$) and >15 years of experience (OR = 8.03, 95% CI: 2.34–27.58, $p < 0.0001$) had significantly higher odds of pain compared to those with <5 years of experience.

In terms of hours at work, working 3–6 hours (OR = 36.92, 95% CI: 4.81–283.33, $p < 0.0001$) or >6 hours (OR = 31.43, 95% CI: 4.16–237.50, $p < 0.0001$) significantly increased the odds of pain compared to working <3 hours.

Finally, for exercise frequency, individuals who exercised 5–6 days per week had significantly lower odds of pain compared to those who exercised daily (OR = 0.29, 95% CI: 0.12–0.71, $p = 0.007$), while those who never exercised had significantly higher odds of pain (OR = 2.86, 95% CI: 1.07–7.69, $p = 0.04$). No significant associations were found for exercising 3–4 days or 1–2 days per week. Overall, age, education level, years of practice, hours at work, and exercise frequency were all significantly associated with the presence of pain, with varying degrees of influence

Table 54. Multivariate Analysis (Logistic Regression) key variables.

Variable	Category	Adjusted Odds Ratio (aOR)	95% CI for aOR	p-value
Age (years)	≤25	1.00 (Reference)	-	<0.0001*
	25 to 34	5.12	(1.65, 15.89)	0.005*
	35 to 44	1.55	(0.52, 4.62)	0.43
	45 to 54	0.68	(0.25, 1.85)	0.45
	≥55	Undefined	-	<0.0001*
Education	BDS	1.00 (Reference)	-	0.002*
	MDS	5.89	(2.25, 15.43)	0.001*
Years of Practice	<5	1.00 (Reference)	-	0.0003*
	5-10	1.70	(0.79, 3.65)	0.17
	11-15	4.72	(1.51, 14.75)	0.008*
	>15	7.85	(2.25, 27.39)	<0.0001*
Hours at Work	<3 hrs	1.00 (Reference)	-	<0.0001*
	3-6 hrs	35.12	(4.52, 272.73)	<0.0001*
	>6 hrs	30.25	(3.95, 231.88)	<0.0001*
Exercise (days/week)	Everyday	1.00 (Reference)	-	0.0002*
	5 to 6	0.28	(0.11, 0.70)	0.006*
	3 to 4	0.73	(0.29, 1.84)	0.51
	1 to 2	4.12	(0.49, 34.48)	0.20
	Never	2.78	(1.02, 7.58)	0.045*

The multivariate logistic regression analysis identified several key variables significantly associated with the presence of pain after adjusting for potential confounders. For age, individuals aged 25–34 years had significantly higher adjusted odds of pain compared to those ≤25 years (aOR = 5.12, 95% CI: 1.65–15.89, p =

0.005), while those aged ≥55 years also showed a significant association with pain, though the adjusted odds ratio was undefined due to zero cases in the "No Pain" group. No significant associations were observed for the 35–44 and 45–54 age groups. In terms of education, individuals with an MDS degree had significantly higher adjusted odds of pain compared to those with a BDS degree (aOR = 5.89, 95% CI: 2.25–15.43, p = 0.001). For years of practice, practitioners with 11–15 years (aOR = 4.72, 95% CI: 1.51–14.75, p = 0.008) and >15 years of experience (aOR = 7.85, 95% CI: 2.25–27.39, p < 0.0001) had significantly higher adjusted odds of pain compared to those with <5 years of experience.

Regarding hours at work, working 3–6 hours (aOR = 35.12, 95% CI: 4.52–272.73, p < 0.0001) or >6 hours (aOR = 30.25, 95% CI: 3.95–231.88, p < 0.0001) significantly increased the adjusted odds of pain compared to working <3 hours. For exercise frequency, individuals who exercised 5–6 days per week had significantly lower adjusted odds of pain compared to those who exercised daily (aOR = 0.28, 95% CI: 0.11–0.70, p = 0.006), while those who never exercised had significantly higher adjusted odds of pain (aOR = 2.78, 95% CI: 1.02–7.58, p = 0.045). No significant associations were found for exercising 3–4 days or 1–2 days per week. Overall, the multivariate analysis confirmed that age, education level, years of practice, hours at work, and exercise frequency remained significant predictors of pain, with consistent trends observed in the univariate analysis.

DISCUSSION

Table 1. Distribution of participants according to age (n=467)

Our study indicates that the majority of dental practitioners in Belagavi are in the 25 to 34 years age group (29.5%), followed by the 45 to 54 years age group (24.2%), the 35 to 44 years age group (21%) and the ≥55 years age group (16.1%), which likely represents more experienced practitioners. The smallest group, the ≤24 years age group (9.2%), is likely composed of recent graduates or dental students.

A similar age distribution was observed in a study conducted among Italian dentists, where the <24 years age group accounted for 22.9%, the 25-35 years age group for 32%, the 36-50 years age group for 17%, the 51-65 years age group for 20% and the >65 years age group for 5.6%.[22]

In contrast, a study conducted among dentists in Jeddah, Saudi Arabia, showed a different age profile, with the 25-35 years age group making up 59.4%, the 36-45 years age group accounting for 23.1%, the 46-56 years age group for 14.5% and the >56 years age group for 3%.[23]

The differences in age distribution among dentists are influenced by factors such as workforce expansion, dental education pathways, and local economic conditions. Regions with a younger workforce, like Jeddah, have more recent graduates, while areas like Italy and Belagavi retain experienced practitioners.

Table 2. Distribution of participants according to gender (n=467)

Our study reveals that females constitute the majority 54.8% of the participants, while males account for 45.2%. This gender distribution aligns with

findings from several studies in the literature, which highlight a growing trend of female representation among dental practitioners.

For instance, a study conducted among dentists in Kerala, India, reported a similar gender distribution, with female dental professionals making up 52.4% and males comprising 47.6%. [24] Similarly, a study conducted among Indonesian dentists noted a significantly higher proportion of female dentists, 78.8% compared to males 21.2%.[25]

The gender distribution observed in our study is consistent with global trends in dentistry, particularly in regions where female participation in the profession is notably high. This shift reflects the increasing number of women entering and excelling in the dental field, which may be attributed to changing societal norms, greater access to education, and evolving career preferences.

Table 3. Distribution of participants according to religion (n=467)

Our study reveals that Hindus constitute the majority 85% of the participants, including Muslims 10.3%, Christians 3.2%, Jains 1.3%, and others 0.2% which reflects the demographic composition of the region where the study was conducted in Belagavi, India.

This distribution is more indicative of the broader demographic trends in the region rather than specific occupational patterns within the dental profession. The religious composition of the study participants is consistent with the demographic profile of the region and similarly reflect the country's diverse religious landscape. And there is no information available in literature with respect to this variable for comparison.

Table 4. Distribution of participants according to Marital Status (n=467)

Our study revealed that, the majority of participants were married 74.1%, unmarried participants 24% and the small percentage of divorced participants 1.9%, this aligns with findings from other studies conducted among dental professionals. For instance, a study conducted in dentist reported a similar trend in Lebanon, where a significant proportion of dentists were married 57%, single 40.1%, Divorced 1% and widowed 1% reflecting the societal norms in the profession.[26]

Similarly, a study found that marital status among dentist in, Malaysia, where majority were married 54.9% and single were 45.1%.[18]

The marital status distribution in our study reflects the demographic and cultural context of the region. While marital status itself may not directly cause WMSDs, it may influence risk factors such as stress levels and work-life balance. Further research could explore how marital status and associated lifestyle factors impact the prevalence and severity of WMSDs among dental professionals.

Table 5. Distribution of participants according to type of family

Our study revealed, that nuclear families constitute the majority (73.4%), joint families (21%), of three-generation families (5.6%).

Similarly, a study conducted in Kerala reported data on nuclear family 69% and joint family 31%.[24] surprisingly previous studies have not explored the potential link between family structure and WMSDs. Further research could explore how family structure impacts occupational health outcomes among dental professionals.

Table 6. Distribution of participants according to educational qualification

Our study showed that, 57% of participants held a Bachelor's degree (BDS) and 43% held a Master's degree (MDS), reflects the typical educational profile of dental professionals in many regions. This finding aligns with a study conducted in Kerala, reported a similar distribution of qualifications among Indian dentists, with a majority holding a BDS degree 68.6% and a significant proportion of 31.4% had higher education as MDS.[24]

This trend in contrast with a study conducted in Karnataka, which considered education qualification as Master's degree comprising of staff 24.5% and PG 44.4%, undergraduate degree comprising of interns 31.1%.[27]

Our study's findings indicate that the majority of dentists hold a BDS degree, aligning with trends in Kerala but differing from Karnataka, where a higher percentage of postgraduate (MDS) qualifications were reported. This variation may be due to regional differences in higher education opportunities and professional career pathways.

Table 7. Distribution of participants according to Speciality

Our study demonstrates a diverse representation across various fields of dentistry. Oral & Maxillofacial Surgery emerged as the most common specialty, accounting (15.94%) of the participants, followed closely by Prosthodontics & Crown Bridge (14.92%) and Orthodontics & Dentofacial Orthopaedics (14.42%). Other specialties, such as Periodontology (12.45%), Conservative Dentistry & Endodontics (11.44%), Oral & Maxillofacial Pathology & Oral Microbiology (9.45%), Oral Medicine and Radiology (8.95%), Public Health Dentistry (8.45%), and Pedodontics

& Preventive Dentistry (3.98%), were also represented, in smaller proportions. This distribution reflects a balanced representation of both surgical and non-surgical specialties, indicating the varied focus areas within the dental profession.

The study among dentists in Jeddah revealed that participants from various dental specialties. That is majority 47% were restorative dentists, Prosthodontists comprised 19.2%, followed by pedodontics at 10.3%. Endodontists and orthodontists each accounted for 7.3%, while periodontists represented 5.6%. Maxillofacial surgeons had the smallest representation, making up only 3.4%.[23]

In contrast, the distribution of participants in the study conducted in Serbia differed significantly from our study, where General Dental Practitioners formed the majority at 64%, followed by Paediatrics Dental Consultants (12.6%). Other specialties, such as Prosthodontics (5.1%), Oral Surgery (4.8%), Endodontics (4.5%), Orthodontics (3.7%), and General Dental Consultants (1.4%), were represented in much smaller proportions. This distribution suggests a strong emphasis on general dental practice in Serbia, where general practitioners likely handle a broader range of dental procedures compared to specialists. In contrast, our study shows a more even distribution across specialties. This difference may reflect variations in the structure of dental care delivery, with Serbia relying more on general practitioners, while our study highlights a more specialized workforce.[28]

Similarly, a study conducted among Brazilian dentist also revealed a diverse distribution of specialties, with Restorative Dentistry being the most represented at 27.5%, followed by Paediatrics Dentistry (17.6%), Oral Surgery (11.8%), and General Practice (11.3%). Other specialties, such as Endodontics (10.8%),

Orthodontics (8.3%), Prosthodontics (5.4%), Periodontics (3.9%), and Dental Implants (3.4%), were also present.[29]

Our study demonstrates a balanced representation of dental specialties, with Oral & Maxillofacial Surgery, Prosthodontics, and Orthodontics being the most common. In contrast, Serbia's dental workforce is dominated by General Practitioners, while the Brazilian study's distribution aligns more closely with our study in terms of the diversity of specialties represented. However, the Brazilian study had a stronger emphasis on Restorative Dentistry and Paediatrics Dentistry, highlighting regional differences in specialization trends.

Table 8. Distribution of participants according to felt reason for not practicing dentistry

Our study revealed that Musculoskeletal Disorders (MSDs) were the most common reason for dentists not practicing dentistry, accounting for 65.6% of participants. Additionally, the "Other" category, accounted for 34.3% of participants. This aligns with a study conducted among Brazilian dentists, which highlighted the significant impact of MSDs, contributing to 30% of dental professionals' inability to work, while other reasons accounted for 9.8%. [29] Similarly, a study conducted in Serbia reported that MSDs are a leading cause of work absenteeism, accounting for 34% of cases.[28]

These findings underscore the significant impact of MSDs on dental professionals' ability to practice, as well as the broader implications for work absenteeism and career continuity.

This gap in research highlights an unexplored area within the occupational health landscape, particularly in understanding the interplay between MSDs and other personal or professional factors that may contribute to dentists leaving the profession. Further exploration of this relationship could provide valuable insights and by addressing these factors, public health initiatives and workplace policies can be tailored to improve the well-being and retention of dentists, ultimately enhancing the sustainability of dental care delivery systems.

Such insights could inform more comprehensive strategies to support dentists and reduce the burden of work-related health issues in the dental profession.

Table 9. Distribution of participants according to other reasons related to not practicing dentistry

Our study revealed the additional reasons for not practicing dentistry, such as transitioning to a non-clinical branch (1.3%), Personal problems (0.6%), and Family issues (0.4%), highlight that while musculoskeletal disorders (MSDs) are the primary occupational concern, other factors also play a role in career decisions among dental professionals.

while MSDs remain the dominant reason for not practicing dentistry, the presence of non-clinical transitions, personal problems, and family issues highlights the multifaceted nature of career decisions in dentistry. Addressing these factors through supportive workplace policies and ergonomic interventions could help retain dental professionals in clinical practice. And there is no information available in literature with respect to this variable for comparison.

Table 10. Distribution of participants based on Hand dominance

The distribution of hand dominance in our study, where the majority of participants were right-handed (87.8%) and a smaller proportion were left-handed (12.2%), aligns with global trends in handedness distribution. This finding is consistent with a study, who reported a similar distribution of right-handed 92% and left-handed 8% individuals among dental professionals in Malaysia.[30]

Similarly, a study done among the dentists of Telangana reported 97.4% of the participants have right hand as dominant hand compared to left hand as 2.6%.[31]

The predominance of right-handed individuals reflects the general population distribution, where right-hand dominance is more common.

Table 11. Distribution of participants according to Years of practicing dentistry

The findings of our study highlight a diverse distribution of years of practice among the 467 participants, reflecting a balanced representation of early, mid, and late-career dentists. The largest proportion of participants (28.9%) had 5–10 years of experience, followed closely by those with more than 15 years of experience (25.91%). Dentists with 11–15 years of experience accounted for 21.2% of the sample, while those with less than 5 years of experience represented 24%. This distribution suggests a stable and mature dental workforce, with a significant presence of experienced professionals who may contribute to the quality and continuity of dental care.

When compared to other studies, for instance, a study conducted among dentists in Jeddah, Saudi Arabia, reported a higher proportion of dentists with 5–10 years of experience (60.3%), followed by those with 11–20 years (23.5%), 21–30

years (13.7%), and 31–40 years (2.6%). Although the specific proportions vary, both studies demonstrate a notable representation of mid- to late-career dentists, underscoring the presence of experienced professionals in the dental workforce.[23]

In contrast, a study conducted among dentists and dental students in Riyadh, Saudi Arabia, revealed a markedly different distribution. The majority of participants (66.5%) had less than 5 years of experience, followed by those with 6–10 years (14.3%), 11–15 years (7.5%), 16–20 years (3.6%), and more than 20 years (3.2%). This distribution indicates a younger and less experienced workforce compared to our study and the Jeddah study. The differences may be attributed to variations in sample composition, such as the inclusion of dental students in the Riyadh study, or regional disparities in workforce demographics, training programs, and retention rates.[32]

Overall, the findings of this study, along with comparisons to other studies, emphasize the variability in the experience levels of dentists across different regions and populations. However, the differences observed in other studies highlight the importance of considering contextual factors, such as regional workforce policies and training opportunities, when interpreting workforce demographics. Future research should explore the underlying factors influencing these distributions, including workforce retention, career progression, and regional disparities, to provide a more comprehensive understanding of the dental profession's dynamics in various settings.

Table 12. Distribution of participants based on Extended breaks

The findings of our study indicate that the vast majority of participants (89.7%) did not take extended breaks during their practice, while a smaller proportion (10.3%) reported taking extended breaks. This may reflect a growing awareness of the importance of rest and ergonomic practices among dental professionals, as well as the

demanding nature of the profession, which often limits opportunities for extended breaks.

However, this trend contrasts sharply with the results of a study conducted in Brazil, where a significant proportion of participants (84.3%) reported opting for breaks. This discrepancy highlights potential cultural, regional, or systemic differences in work practices and attitudes toward rest and self-care among dental professionals.[29]

These differences may be influenced by cultural, regional, or systemic factors, emphasizing the need for tailored interventions to promote rest and ergonomic practices in different contexts. Future research should explore the underlying reasons for these disparities and investigate strategies to encourage healthier work habits, such as Extended breaks. By addressing these issues, the dental profession can better support the health and longevity of its practitioners, ultimately improving both patient care and professional satisfaction.

Table 13. Distribution of participants based on Duration of Extended breaks

Our study revealed, the duration of these breaks varied, the majority, 66.6% took breaks lasting between 1 and 2 months. A smaller group, 25% had breaks of less than a month and only 2.08% took breaks between 3 and 4 months, while 6.25% took breaks longer than 4 months.

However, this aligns with the results of a study conducted in Brazil, where a significant proportion of participants 74.5% reported opting for breaks for 1-2 months during their practice, where as 25.5% opted to take break for more than 3 months.[29]

Our study shows that most participants took breaks of 1-2 months, similar to findings in Brazil, where 74.5% preferred the same duration. However, fewer participants in our study opted for breaks longer than 3 months compared to the Brazilian study, indicating regional differences in break-taking practices.

Table 14. Distribution of participants based on Hours of working in Dental practice

Our study revealed that, 51.4% reported working more than 6 hours per day,40.5% of the participants worked for 3-6 hrs, while a smaller proportion of 8.1% worked less than 3 hours per day. This indicates that a significant portion of the study population engages in prolonged working hours in dental practice.

In comparison, a study conducted in Finland provides insights into the weekly working hours among dentists and dental students. The majority of respondents (47%) worked less than 16 hours per week, primarily consisting of dental students balancing their studies with part-time work. Additionally, 35% of respondents worked between 16 and 30 hours per week, while 15% worked between 31 and 40 hours per week. Only a small percentage (4%) worked more than 40 hours per week. These findings highlight the differences in work commitments between dental students, who often work part-time, and practicing dentists, who typically have longer and more consistent working hours. The Finland study also underscores the importance of balancing professional responsibilities with personal well-being, as longer working hours can contribute to physical and mental fatigue.[33]

Similarly, a study conducted in Jeddah, Saudi Arabia, provides additional context regarding working hours among dentists. In this study, 45.7% of respondents worked between 15 and 30 hours per week, 35% worked between 31 and 40 hours per

week, and 19.2% worked between 41 and 50 hours per week. These findings indicate that while a significant proportion of dentists in Jeddah work moderate hours, a notable percentage work longer hours.[23]

Overall, these studies demonstrate variability in working hours among dental professionals across different regions and career stages. Future research identifies strategies to promote healthier work practices; by addressing these issues, the dental profession can better support the health and longevity of its practitioners, ultimately improving both patient care and professional satisfaction.

Table 15. Distribution of participants based on Scheduled breaks

Our study revealed that a significant majority of participants (85%) reported taking scheduled breaks is a positive indicator of ergonomic awareness and workplace practices among dental professionals in our study. This suggests that many dental professionals recognize the importance of incorporating Scheduled breaks into their work routines to reduce physical strain and prevent work-related musculoskeletal disorders (WMSD).

In contrast, a study conducted in Yemen revealed that only 45.48% of participants opted for scheduled breaks. This significant difference in break-taking practices may reflect variations in workplace policies. The lower percentage of scheduled breaks in Yemen could also indicate a lack of awareness about the benefits of regular rest periods or the presence of workplace environments that do not prioritize ergonomic practices.[5]

These findings highlight the need for targeted interventions, such as ergonomic training programs and workplace policies that encourage regular breaks, to improve the health and well-being of dental professionals in regions where such practices are less common.

Overall, the comparison between these studies underscores the importance of promoting ergonomic awareness and implementing supportive workplace practices across different regions.

Table 16. Distribution of participants based on No of Scheduled breaks

The findings of our study reveal that among the 397 participants, the distribution of scheduled breaks varied significantly. The majority of participants, 39.7%, reported taking one scheduled break during their workday, while 35% took two breaks. A smaller proportion, 17.1%, took three breaks, and only 8.2% took four breaks. These results indicate that while a significant portion of dental professionals incorporate scheduled breaks into their work routines, the frequency of breaks varies widely among individuals.

Another study conducted among young dentists of Indonesia found that 64.7% of the respondents took one break during their workday, while 14.9% took a break after every single patient. However, 20.3% of the dentists reported taking no breaks at all during their workday. This suggests that while a majority of dentists incorporate breaks into their work routine, a significant portion do not take regular breaks.[34]

Our study shows that most dental professionals take at least one scheduled break, similar to Indonesian dentists, where 64.7% reported the same. However, a

notable difference is that 20.3% of Indonesian dentists took no breaks, highlighting varying work routines and potential strain across regions.

Table 17. Distribution of participants based on treating no of average patients

The distribution of the average number of patients treated by dentists in our study reveals a diverse workload among participants. The largest proportion of dentists (32.3%) treated 6-10 patients per day, followed closely by those treating 11-15 patients (30.7%). A significant percentage (22.9%) treated more than 15 patients daily, indicating a high patient load for a considerable number of practitioners. In contrast, only 14.1% of dentists treated 1-5 patients per day, suggesting that the majority of participants in this study had a moderate to high patient load.

When compared to the study conducted in the United Arab Emirates (UAE), where 47.8% of dentists treated 8 or fewer patients per day and 52.2% treated more than 8 patients, study shows a higher proportion of dentists handling a larger number of patients.[35]

In contrast, the study from Sana'a City, Yemen, reported that the majority of dentists (70.6%) treated 1-3 patients per day, with only 20.6% treating 4-6 patients and a very small percentage (6.12%) treating 7-9 patients. This indicates a much lower patient load compared to both, our study and the UAE study. The Yemeni study highlights a significantly lighter workload, which may contribute to lower stress levels and potentially fewer health implications among dental professionals in that region.[5]

Overall, the comparison of these studies underscores the variability in patient load among dentists across different regions. Our study suggests a higher workload compared to both the UAE and Yemeni studies, which could have significant implications for the physical and mental well-being of dental professionals.

Table 18. Distribution of participants according to posture at work

The distribution of work posture among dental professionals reveals significant trends across different studies. Among the participants, the majority, 59.55%, reported working in a mostly seated position, while 24.4% worked mostly standing. A smaller proportion, 11.6%, remained seated throughout their work, and only 4.5% worked standing for the majority of their time. This indicates a strong preference for seated postures, likely due to the precision and stability required in dental procedures.

Similarly, in a study conducted among dental professionals and students in Riyadh, Saudi Arabia, the majority of dentists preferred working in a sitting position. Specifically, 57.4% of male dentists and 58.8% of female dentists reported sitting as their preferred posture. A smaller percentage, 33.5% of males and 29.2% of females, alternated between sitting and standing, while only 9.1% of males and 12.1% of females preferred standing. This further emphasizes the prevalence of seated postures in dental practice, particularly among female dentists, who showed a slightly higher preference for sitting.[32]

In another study conducted at Manipal in Karnataka, India, the majority of participants (65.6%) reported using a combination of sitting and standing postures while treating patients. However, 29.1% of the participants exclusively practiced sitting dentistry, and only 5.3% preferred standing dentistry. This suggests

that while a combination of postures is common, a significant portion of dental professionals still rely heavily on seated positions.[27]

Our study, like those in Riyadh and Manipal, highlights a strong preference for seated postures among dental professionals, likely due to the precision required in procedures. However, while Riyadh dentists mostly sit, Manipal dentists prefer a mix of sitting and standing, indicating regional differences in ergonomic practices.

Table 19. Distribution of participants according to use of dental loupes in daily practice

Our study revealed that, 42% of participants reported using dental loupes in their daily practice, indicating that nearly half of the surveyed dentists utilize this tool. Conversely, the majority, 58%, did not use dental loupes regularly.

Further insights from another study reveal that 57.6% of dentists in Indonesia never use dental loupes for magnification during their practice. Only 11.3% reported always using them, while 6.9% used them very frequently. A smaller proportion of dentists (13%) rarely used loupes, and 11.3% used them often.[34]

similar to findings in Indonesia, where 57.6% never use them. This highlights a global trend of limited loupe adoption, despite its benefits in enhancing precision and ergonomics in dental practice.

Table 20. Distribution of participants according to Awareness of posture

Our findings reveal significant variability in posture awareness among the 467 participants, highlighting a potential area of concern for occupational health in dentistry. Only a small fraction of dentists (10.1%) reported being always aware of their posture, suggesting that the majority may not consistently prioritize ergonomic

practices during their work. While a larger segment (37.9%) indicated being aware of their posture most of the time, the largest group (40.7%) admitted to only sometimes being aware, and a notable 11.3% reported never being conscious of their posture.

Similarly, a study conducted among dentist in United Arab Emirates provided insight on awareness of posture where 11.8% were aware of posture.[35] This highlights a widespread lack of ergonomic consciousness among dental professionals, prolonged periods of poor posture can lead to chronic pain, fatigue, and long-term physical strain, ultimately affecting both the quality of care and the longevity of a dentist's career.

Future research could explore the specific barriers to posture awareness and evaluate the effectiveness of ergonomic training programs in improving posture.

Table 21. Distribution of participants according to Use of Ergonomic chair

Our study revealed that, among the 467 participants, 42.6% reported using ergonomic chairs in their daily practice, indicating that less than half of the surveyed dentists utilize this ergonomic tool. In contrast, the majority, 57.4%, did not use ergonomic chairs, suggesting a significant gap in the adoption of ergonomic equipment.

These findings are consistent with similar studies conducted in other regions. For instance, a study among dentists in the United Arab Emirates found that 33.7% of respondents reported using ergonomic chairs in their daily practice.[35]

Similarly, a study conducted in Andhra Pradesh, India, revealed that only 36.7% of dentists used ergonomic dental chairs. The alignment of these results across

different geographic contexts underscores a global trend of underutilization of ergonomic chairs in dental practice.[31]

Additionally, further research could explore the specific challenges dentists face in adopting ergonomic practices and evaluate the effectiveness of interventions aimed at promoting their use. By prioritizing ergonomics, the dental community can work toward improving both practitioner well-being and patient care.

Table 22. Distribution of participants according to Rating of posture

Our study results reveal a notable disparity in how dentists perceive their posture, with only a small fraction (5.8%) rating it as "very good." The majority (48.6%) described their posture as "good," while a significant proportion (34.9%) viewed it as "average," and 10.7% assessed it as "poor." These findings suggest that while most dentists believe their posture is at least acceptable, a considerable number recognize room for improvement, and a small but notable minority acknowledge significant issues.

The findings underscore the need for greater emphasis on ergonomic education and training within the dental community. Many dentists may not fully understand the importance of maintaining proper posture or may lack the knowledge and tools to implement ergonomic practices effectively.

Further research could explore the specific factors influencing posture perception and evaluate the effectiveness of ergonomic interventions in improving posture and reducing musculoskeletal strain among dental professionals. And there is no information available in literature with respect to this variable for comparison.

Table 23. Distribution of participants according to practicing regular Muscle stretches

Our study revealed that, 31% reported regularly practicing muscle stretches and a substantial majority 69%, stated that they do not engage in regular muscle stretching. Our findings align with a similar study, conducted in young dentists of Yemen, highlighted that majority 70.32% did not practice any form of stretching activities and only 29.67% dentist practiced daily stretching exercises.[5] and similarly, study conducted in Jeddah Saudi Arabia among dental practitioners showed that only 31.6% performed stretching exercises after clinical practice.[23]

In contrast, A study conducted among doctors of Mangalore, reported that majority 57.9% practiced muscle stretching exercises and 42.1% of the doctors did not perform any stretching exercises.[10]

The dentists need to practice stretching exercises regularly to avoid WMSDs.

Table 24. Distribution of participants according to Training regarding ergonomics while studying at university

Our study showed that 41.3% had received training regarding ergonomics during their university studies. Whereas a larger proportion, 58.7%, reported not having received any training on ergonomics while at university.

Similarly, A study conducted in Australian dentist highlighted that the respondents 30% of dentists and 23.2% of orthodontists had received education in relation to ergonomics while studying at university.[17]

Our study found that 41.3% of dentists received ergonomics training during university, which is higher than the Australian study, where only 30% of dentists and 23.2% of orthodontists received such education. This highlights a global gap in ergonomic training, emphasizing the need for improved integration into dental curricula.

Table 25. Distribution of participants according to no of days of exercise each week

The findings from our study highlight a concerning trend of sedentary behaviour among participants, with a significant portion (42.4%) reporting never engaging in exercise. However, among those who do exercise, there is a notable distribution in frequency, with 20.6% exercising daily, (10.5%) exercising 5 to 6 times a week, 17.6% exercising 3 to 4, and 9% exercising 1 to 2. This indicates that while a smaller group maintains consistent exercise habits, the majority either exercise infrequently or not at all.

Comparatively, the study conducted among Italian dentists reveals a slightly different pattern, with a lower percentage (28.9%) reporting never exercising and a higher proportion (36.3%) engaging in physical activity at least once a week. Additionally, 26.7% of dentists exercise two to three times a week, and 8.1% exercise daily.[22]

Our study shows a high level of sedentary behaviour, with 42.4% never exercising, whereas Italian dentists reported a lower percentage (28.9%) of non-exercisers. Additionally, Italian dentists had a higher frequency of regular physical activity, indicating regional differences in exercise habits among dental professionals.

These differences may reflect variations in occupational demands, cultural attitudes toward physical activity, or access to exercise opportunities between the two groups. Overall, both studies underscore the need for targeted interventions to promote regular physical activity, particularly among those who are entirely sedentary, as consistent exercise is crucial for maintaining long-term health and reducing the risk of chronic diseases.

Table 26. Distribution of participants according to duration of exercise each week

The findings from our study, reveal that the vast majority (94.8%) engage in exercise for 1 to 2 hours per week, with only a small proportion exercising for longer durations (2.3%) for 2-4 hours and (3%) for 4-6 hours. Notably, no participants reported exercising for more than 7 hours per week, indicating that prolonged or intensive physical activity is uncommon in this group.

In comparison, the study conducted among Italian dentists shows a more varied distribution of exercise duration. While a significant proportion of dentists (29.2%) reported never exercising, a larger percentage (39.8%) engaged in physical activity for 2-3 hours per week, and 14.5% exercised for 5-10 hours. Additionally, 3.5% of dentists reported exercising for more than 10 hours weekly, indicating a subset with a high level of physical activity.[22]

Table 27. Distribution of participants according to presence of medical condition limiting to undertake exercise

Our findings reveal that a significant majority of the 467 participants (93.6%) reported no medical conditions restricting their exercise activities, while only a small

proportion (6.4%) indicated having such conditions. This suggests that the vast majority of the studied population is free from health limitations that could hinder their ability to engage in physical exercise. The low prevalence of exercise-restricting medical conditions may reflect the overall good health status of the participants, which could be attributed to factors such as age, lifestyle, or access to healthcare. And there is no information available in literature with respect to this variable for comparison.

Table 28. Distribution of participants according to practicing any form of meditation or relaxation therapy

Our study findings indicate that a notable proportion of the 467 participants (30.2%) reported practicing some form of meditation or relaxation therapy, while the majority (69.8%) did not engage in such practices. This suggests that while a significant minority of the population recognizes the potential benefits of mindfulness and relaxation techniques, a larger segment has yet to adopt these practices. The relatively low adoption rate of meditation or relaxation therapy may reflect a lack of awareness, accessibility, or perceived need for such practices among the majority of participants. And there is no information available in literature with respect to this variable for comparison.

Table 29. Distribution of participants according to practicing any form of protocol been implemented at work place to reduce WMSDs

Our study participants revealed, only 10% reported that their workplace has implemented protocols to reduce WMSDs, while a significant majority, 90%, indicated that no such protocols are in place.

Our study findings align with Similar studies conducted, for instance, A study conducted in young dentists of Yemen, highlighted that majority 70% of the dentist reported not practicing any form of protocol at work place and only 30% of dentist reported positively for practicing any form of protocol been implemented at work place to reduce WMSDs.[29] In contrast, A study conducted in Riyadh , revealed that 43.1 % of males and 55% females are practicing ergonomics at work place.[32]

Our study found that only 10% of workplaces have protocols to reduce WMSDs, aligning with findings from Yemen, where 70% reported no such practices. In contrast, the Riyadh study showed higher adherence to ergonomic practices, indicating regional differences in workplace awareness and implementation of WMSD prevention measures.

Table 30. Distribution of participants according felt that protocol implemented has improved the ergonomics of work environment

Among our participants, a small percentage felt that the protocols have greatly improved ergonomics 4.9%, while 9.4% noted a slight improvement. However, the majority of participants were unsure about the impact of these protocols, with 82.9% expressing uncertainty. Additionally, only a small number 2.8% reported no improvement. In contrast, a study conducted in Riyadh showed that 81.1% males and 86.9% females felt that protocols have improved ergonomics at work place.[32]

Table 31. Distribution of participants according perception that would training regarding ergonomics in work place would be useful

Our study showed a significant majority, 80.3%, believed that such training would be useful. In contrast, 19.7% did not see the value in ergonomic training.

Similarly, a study conducted among young dentists of Yemen, highlighted that majority 79.35 % of the dentist felt that training regarding ergonomics would we useful for work place and 20.64% of dentists felt that training regarding ergonomics in work place would not be useful.[5]

Our study found that 80.3% of participants saw ergonomic training as useful, closely matching the Yemen study, where 79.35% shared the same view. This consistency highlights a widespread recognition of the importance of ergonomic education in improving workplace health.

Table 32. Distribution of participants according to alcohol consumption

Our study findings reveal that a significant majority of the 467 participants 80.5% reported not consuming alcohol, while a smaller proportion 19.5% indicated that they did consume alcohol. This distribution suggests that alcohol consumption is relatively uncommon in the studied population, with most individuals abstaining from it. The low prevalence of alcohol consumption may reflect cultural, religious, or social norms that discourage alcohol use, as well as potential awareness of its health risks. And there is no information available in literature with respect to this variable for comparison.

Table 33. Distribution of participants according to Amount of alcohol consumption

The findings of our study reveal that the majority of participants (80.6%) were non-alcoholic, indicating that a significant proportion of the population abstains from alcohol consumption. This aligns with cultural, religious, or social norms that may discourage alcohol use and reflects a generally health-conscious behaviour among the

majority of the studied population. However, a notable proportion of participants (17.5%) reported consuming 30 units of alcohol, which suggests that a subset of the population engages in moderate to potentially risky drinking behaviour. Additionally, a very small percentage of participants consumed higher amounts of alcohol, with 1.6% consuming 180 units, and 0.2% each consuming 90 and 60 units, respectively. These findings highlight the presence of varying levels of alcohol consumption within the population, with a small but significant minority engaging in higher or potentially harmful levels of drinking. And there is no information available in literature with respect to this variable for comparison.

Table 34. Distribution of participants according to Frequency of alcohol consumption

Our study findings reveal a notable pattern of alcohol consumption among the 467 participants, with the majority (80.6%) identified as non-alcoholic. This suggests that a significant proportion of the study population abstains from alcohol, which may reflect cultural, health-related, or personal preferences influencing drinking behaviour.

A smaller percentage of participants reported occasional alcohol consumption (8.3%), while regular drinkers were divided into daily (3.6%), weekly (3.6%), and monthly (3.9%) consumers. The relatively low prevalence of frequent alcohol use (daily and weekly drinkers combined at 7.2%) indicates that habitual drinking is not common in this group. And there is no information available in literature with respect to this variable for comparison.

Table 35. Distribution of participants according to Tobacco habit

Our study revealed that tobacco usage habits showed that 9.5% were smokers, 0.6% used smokeless tobacco, and 0.2% used both smoking and smokeless tobacco. The majority, 89.7%, did not consume tobacco. This align with the findings from a similar study conducted among dentists in China, reported that majority 80.9% were non-smokers and only 19.1% were smokers.[36]

Table 36. Distribution of participants according to Type of tobacco habit

The findings of our study indicate that the majority of participants (89.7%) did not consume tobacco, reflecting a strong trend toward tobacco abstinence in the studied population. This high percentage of non-users suggests that cultural, social, or health-related factors may discourage tobacco use among the majority. However, a small but notable proportion of participants reported tobacco use, with 9.5% identifying as smokers, 0.6% using smokeless tobacco, and 0.2% using both smoking and smokeless tobacco. These results highlight the presence of varying tobacco usage habits within the population, with a minority engaging in behaviours that pose significant health risks. And there is no information available in literature with respect to this variable for comparison.

Table 37. Distribution of participants according to BMI

Our study revealed that the majority, 50.1% fell into the normal weight category. This was followed by 39.2% of participants who were classified as overweight, while 8.8% were categorized as obese. A small proportion, 1.9%, were underweight. These findings indicate that a significant portion of the study

population had a BMI within the normal range, though a considerable percentage were either overweight or obese.

Similarly, a study conducted in Saudi Arabia provided a detailed breakdown of the participants' Body Mass Index (BMI), revealing that the majority 62.65% fell within the normal range of (BMI= 18.5–24.9), while 15.06% were classified as overweight (BMI = 25.0–29.9), and 9.94% were obese (BMI ≥ 30). On the lower end of the spectrum, 9.64% were underweight (BMI = 16.5–18.4), and 2.71% were severely underweight (BMI < 16.5).[16]

Similarly, A study conducted in Manipal, Karnataka revealed that the majority of the 536 dentists surveyed fell within the normal BMI range. Specifically, 71.64% had a normal BMI (20–24.9 kg/m²), while 12.68% were classified as overweight (BMI = 25–29.9 kg/m²), and 1.49% were obese (BMI ≥ 30 kg/m²). On the lower end of the spectrum, 14.17% were underweight (BMI < 20 kg/m²).[4] This suggest that majority of dentists had normal BMI across different regions.

Table 38. Distribution of participants according to presence of pain

Our study found that musculoskeletal pain is highly prevalent among the study population, with 91.4% of participants reporting experiencing such pain, while only 8.6% reported no musculoskeletal pain. These results underscore the widespread nature of musculoskeletal pain, affecting nearly all participants in the study.

These findings are consistent with other similar studies. For example, a study conducted among dentists in Manipal, Karnataka, reported a 100% prevalence of pain.[4] Similarly, a study in Mumbai among dental surgeons found that 100% of participants reported musculoskeletal disorders (MSDs).[9] Another study in Bhopal

among dental practitioners revealed that 92% of participants experienced pain.[3] Additionally, a study conducted in Telangana among dentists highlighted that 69% of dentists reported pain.[31] These consistent findings across different regions further emphasize the high prevalence of musculoskeletal pain among dental professionals.

Table 39 . Distribution of WMSDs according to the anatomical site (n=427)

Our study revealed that, neck emerged as the most affected region (38.2%), followed by the lower back (35.1%), shoulders (24.1%), and upper back (21.5%). Moderate prevalence was observed for wrist/hand (18.9%) and elbow (16.2%) complaints, while knee (14.3%), hip/thigh (10.5%), and elbow/foot (9.6%) disorders were less common. These findings consistently identify the neck and lower back as primary sites of musculoskeletal strain, reinforcing their recognition as high-risk areas in dental practice.

Similarly, findings from Manipal-based study reported that, most affected region was neck (75.74%), followed by wrist/hand (73.13%), and lower back/pelvis (72.01%) as most frequently affected, followed by shoulder/arm (69.40%). While prevalence rates differ numerically between studies - potentially due to variations in population characteristics - both demonstrate consistent patterns of regional susceptibility. This remarkable consistency across geographically distinct studies strongly suggests that certain musculoskeletal regions are inherently vulnerable in dental professionals due to occupational exposures.[4]

The observed distribution likely reflects the biomechanical demands of dental work, where sustained static postures, repetitive motions, and precision requirements create cumulative stress on the cervical spine, lumbar region, and upper extremities. The lower prevalence in lower body regions supports this interpretation, as dental

work predominantly engages upper body musculature. Of particular concern is the high neck involvement, which may relate to prolonged forward head posture during clinical procedures. Similarly, the substantial lower back complaints likely stem from prolonged sitting with inadequate lumbar support.

These findings carry important implications for occupational health interventions in dentistry. The consistent identification of high-risk anatomical regions across studies suggests that ergonomic solutions should prioritize, neck support and positioning aids, lumbar support in dental chairs, and arm support. Furthermore, the variation in prevalence across specialties underscores the need for discipline-specific ergonomic adaptations. For instance, prosthodontists and oral surgeons who reported higher rates may benefit from specialized equipment to reduce static loads during complex procedures. our study confirms and extends previous findings regarding the anatomical distribution of WMSDs in dental professionals. The consistent patterns across studies strengthen the evidence base for developing targeted preventive strategies and highlight the urgent need for ergonomic innovations in dental practice settings.

Table 40. Distribution of Musculoskeletal pain according to Education

The findings from our studies consistently demonstrate that musculoskeletal disorders represent a significant occupational hazard for dental professionals, with prevalence and distribution patterns varying according to clinical roles and work environments. Our study revealed that general dentists (BDS) showed the highest prevalence of musculoskeletal pain (54.2%), while among specialists, oral and Maxillofacial surgeons (7.0%), prosthodontists (6.7%), and orthodontists (6.7%) were most affected. This variation likely reflects the distinct ergonomic demands of

different dental specialties, where procedures requiring prolonged static postures and repetitive movements appear to contribute most significantly to musculoskeletal strain.

In contrast, data from Karnataka highlights important differences between teaching and clinical dentists. Teaching staff reported high rates of neck (78.3%) and shoulder (83.5%) discomfort, likely resulting from sustained forward head postures during lectures and demonstrations. In contrast, clinical practitioners exhibited more widespread musculoskeletal issues, particularly in the wrists (86.4%) and lower back (87.0%), areas most vulnerable to the repetitive motions and constrained postures characteristic of patient care. These findings suggest that while both academic and clinical dental activities pose ergonomic risks, the nature and distribution of musculoskeletal strain differ substantially between these professional roles.[3]

The Malaysian study further reinforces these observations by demonstrating clear disparities between clinical and preclinical dental students. Clinical trainees reported dramatically higher rates of discomfort in all body regions, with particularly pronounced differences in neck/upper back 82% and hand/finger symptoms 42%. These findings underscore how the transition to hands-on clinical training introduces significant new physical demands, including prolonged static postures, repetitive hand movements, and sustained arm elevation that collectively contribute to musculoskeletal strain.[25]

Table 41. Association of WMSDs with Age

The association between age and musculoskeletal pain was found to be statistically significant, with a mean age of 40 ± 11 years among the 467 participants. The prevalence of pain varied across different age groups. In the ≤25 years age

group, 86.0% of participants reported experiencing pain. This prevalence increased to 97.1% in the 25 to 34 years age group. For participants aged 35 to 44 years, 90.8% reported pain, while in the 45 to 54 years age group, 81.4% experienced pain. Notably, in the ≥55 years age group, 100% of participants reported musculoskeletal pain. These findings demonstrate that musculoskeletal pain is highly prevalent across all age groups, with the burden of pain increasing significantly with age. The universal prevalence of pain among participants aged ≥55 years underscores the strong association between advancing age and musculoskeletal pain.

Similarly, a study conducted in Serbia found that older dentists were more likely to report musculoskeletal pain. Specifically, the mean age of dentists who reported pain was 44 ± 9 years, compared to 34 ± 6 years for those who did not report pain. This difference was statistically significant, further supporting the finding that age is a significant risk factor for musculoskeletal pain.[28]

These results highlight the importance of addressing musculoskeletal pain as a critical issue, particularly among older individuals, where the prevalence of pain is nearly universal. The findings suggest that preventive measures and ergonomic interventions should be prioritized, especially for older professionals, to mitigate the impact of musculoskeletal pain and improve overall quality of life.

Table 42. Association of WMSDs with Gender

The association between gender and musculoskeletal pain was analysed, and no statistically significant association was found. Among the participants, 91.5 % of males and 91.4 % of females reported experiencing musculoskeletal pain, our study indicates that the distribution of pain was similar across both genders.

Similarly, a study conducted among dentists and dental students revealed that 95.8% of participants reported experiencing musculoskeletal pain at some point in their lives. This prevalence was slightly higher in females (61.5%) compared to males (34.2%), but this association was not statistically significant. This further supports the notion that gender may not be a significant determinant of musculoskeletal pain in certain populations.[37]

In contrast, a study conducted in Serbia among dentists found that 72.1% of female dentists reported experiencing musculoskeletal pain, compared to 27.9% of male dentists. This indicates that female dentists were more likely to report pain than their male counterparts. The difference in pain prevalence between genders was statistically significant, suggesting that gender is a significant risk factor for musculoskeletal pain among dentists in this population.[28] Similarly findings of a study conducted in Karnataka reported that 76.1 % of female had pain compared to 23.9 % of males and pain prevalence between genders was statistically significant.[4]

These contrasting findings highlight the variability in the association between gender and musculoskeletal pain across different studies and populations. While some studies suggest no significant gender-based differences in pain prevalence, others indicate that females may be at a higher risk of experiencing musculoskeletal pain. This discrepancy could be attributed to differences in study design, sample characteristics, or cultural and occupational factors influencing pain reporting and experience. Further research is needed to better understand the role of gender in musculoskeletal pain, particularly in high-risk professions such as dentistry.

Table 43. Association of WMSDs with according to BMI

In our study association between BMI and musculoskeletal pain was analysed, Among the 467 participants, the prevalence of pain varied across BMI categories. In the underweight group, 100% reported experiencing pain, with none being pain-free. For those with normal weight, 89.7% reported pain, while among overweight individuals, 94.0% reported pain and in the obesity category, 87.8% reported pain. and no statistically significant association was found, indicating that the distribution of pain did not significantly differ across BMI categories. These findings suggest that musculoskeletal pain is prevalent across all BMI groups, with no significant variation based on weight status.

In contrast A study conducted among Italian dentists, findings reveal several key trends. In the underweight group, 75% reported WMSDs, In the normal weight category, 85.1% reported WMSDs. This pattern continued in the slight overweight group, 86.3% reported WMSDs. Interestingly, in the overweight group 83.4% reported WMSDs, and remained statistically significant.[22]

The contrasting findings between the two studies may be attributed to differences in study populations, methodologies, and the specific nature of musculoskeletal issues being examined.

Table 44. Association of WMSDs with Education

The findings of our study, indicate a significant association between education level and musculoskeletal pain, can be compared to a study conducted in Italy that examined work-related musculoskeletal disorders (WMSDs) among dental professionals. In our study, 86.8% of participants with a BDS degree reported

musculoskeletal pain, compared to 97.5% of those with an MDS degree, confirming a statistically significant difference. This suggests that individuals with a MDS degree are more likely to experience musculoskeletal pain than those with an BDS degree. In contrast, the Italian study found that dental specialists, general practitioners, and dental hygienists all reported varying prevalence rates of WMSDs, with significant differences observed based on occupation. For instance, 90.8% of dental specialists, 84.9% of general practitioners, and 80.7% of dental hygienists reported the presence of WMSDs.[22]

Both studies underscore the high prevalence of musculoskeletal pain among dental professionals, but through different lenses. The Italian study suggests that occupational roles may influence the risk of WMSDs, while our study identifies educational attainment as a significant predictor. These differences may be attributed to variations in study populations, work environments, or cultural factors. However, the consistent theme across both studies is the high burden of musculoskeletal pain among dental professionals, highlighting the need for targeted interventions to address ergonomic practices, workload management, and preventive measures tailored to specific subgroups, such as those with lower educational qualifications or specific occupational roles.

Table 45. Association of WMSDs according to Specialty

The findings of our study reveal a high prevalence of musculoskeletal pain across all dental specialties, with no statistically significant variation based on the field of practice. For instance, specialties such as Prosthodontics & Crown Bridge (96.7%), Oral Medicine and Radiology (94.4%), and Oral & Maxillofacial Surgery (93.8%) reported high pain prevalence, while oral maxillofacial pathology and oral

microbiology, Orthodontics, Conservative Dentistry, and Periodontology showed 100% prevalence. This suggests that musculoskeletal pain is a universal occupational hazard in dentistry, irrespective of specialization. In contrast, a study from Serbia highlighted significant variations in pain prevalence across specialties, with paediatrics and preventive dentistry reporting the highest pain rates (37.8%) and endodontics showing the lowest (9.2%).[28]

These differences may arise from variations in ergonomic practices, procedural demands, or study populations. While our study emphasizes the widespread nature of musculoskeletal pain across all fields, the Serbian study underscores the influence of specific specialty-related factors. Both studies, however, highlight the critical need for ergonomic interventions and preventive strategies tailored to the unique demands of each dental specialty to mitigate this occupational health issue.

Table 46. Association of WMSDs with Hand dominance

The findings of our study indicate 90.7% of right-handed individuals and 96.5% of left-handed individuals reported experiencing pain, with no statistically significant association between hand dominance and musculoskeletal pain significant difference between the two groups. This suggests that musculoskeletal pain is a common occupational issue among dental professionals, regardless of hand dominance. These results are consistent with a study conducted among dentists in Serbia, which found that 97.3% of participants were right-handed and 2.7% were left-handed, with no significant difference in pain prevalence between the two groups.[28]

The lack of a significant association between hand dominance and musculoskeletal pain in both studies highlights that the ergonomic challenges and repetitive tasks inherent in dental practice affect both right-handed and left-handed individuals equally. The bilateral nature of dental work, which often requires the use of both hands, likely contributes to the symmetrical distribution of pain observed across both groups. This reinforces the idea that musculoskeletal pain in dentistry is more closely related to occupational factors, such as prolonged static postures, repetitive motions, and improper tool use, rather than hand dominance.

Table 47. Association of WMSDs with according to Years of practicing dentistry

The findings of our study reveal a statistically significant association between years of practicing dentistry and musculoskeletal pain, with the prevalence of pain increasing with experience. Specifically, 83.0% of participants with <5 years of experience reported pain, rising to 89.6% in the 5–10 years group, 96 % in the 11–15 years group, and 97.5% among those with >15 years of experience. This trend suggests that musculoskeletal pain becomes more prevalent and severe as dental professionals accumulate more years of practice, likely due to the cumulative effects of occupational strain, repetitive tasks, and prolonged exposure to ergonomic risk factors.

Similarly, a study conducted among dentists in Dhahran also found a significant association between years of experience and pain , with the highest prevalence of pain reported among those with 5–10 years of experience (60%), followed by >10 years (26.2%) and 1–5 years of experience (13.9%).While the Dhahran study reported lower overall prevalence rates, both studies consistently

highlight that musculoskeletal pain increases with years of practice, underscoring the chronic nature of this occupational hazard.[38]

Table 48. Association of WMSDs with according to posture at work

Our study revealed, pain prevalence was high across all postures, 96.3% for seated, 91.4% for mostly seated, 89.5% for mostly standing, and 90.5% for standing postures. This suggests that musculoskeletal pain is prevalent regardless of working posture, likely due to the ergonomic challenges inherent in dental practice, as no significant association between posture at work and musculoskeletal pain.

In contrast, a study conducted among dentists in Manipal, Karnataka, revealed that 62.5% used a combination of sitting and standing, 31.8% practiced sitting dentistry, and 5.7% practiced standing dentistry, with a significant association between posture and musculoskeletal disorders. [27] This discrepancy may highlight the differences in study populations, ergonomic practices, or methodological approaches. While the Manipal study highlights posture as a significant factor, our study emphasizes that musculoskeletal pain is a universal issue in dentistry, affecting professionals across all postures.

Table 49. Association of WMSDs with according to Hours of working in Dental practice

In our study, association between hours of working in dental practice and musculoskeletal pain was found to be statistically significant. Among the 467 participants, the prevalence of pain varied significantly based on working hours. For those working <3 hours/day, 34.2% reported pain. Among those working 3-6 hours/day, 99.5% reported pain. For individuals working >6 hours/day, 94.2%

reported pain, indicating a significant difference in the distribution of pain based on working hours.

Similarly, a study conducted among Italian dentists revealed that analysis of musculoskeletal pain based on working hours per day revealed significant differences among dental professionals. Participants working 4 hours per day reported a pain prevalence of 26.1%, Among those working 5–8 hours per day, 15.8% reported pain, for those working more than 8 hours per day, the pain prevalence was 8.6%, The association between working hours and pain was statistically significant, these findings suggest that longer working hours are associated with a higher prevalence of musculoskeletal pain.[22]

Table 50. Association of WMSDs and consumption of alcohol

Our study revealed that no significant association between alcohol consumption and musculoskeletal pain was found among participants, 93.4% of alcohol consumers and 91% of non-consumers reported pain, indicating no statistically significant difference in pain prevalence between the two groups. This suggests that musculoskeletal pain is prevalent regardless of alcohol consumption, likely due to the ergonomic and occupational demands of dental practice rather than lifestyle factors like alcohol use. And there is no information available in literature with respect to this variable for comparison.

Table 51. Association of WMSDs and consumption of tobacco

Our study found no significant association between tobacco consumption and musculoskeletal pain. Among 467 participants, 89.6% of tobacco consumers and 91.6% of non-consumers reported pain, indicating no significant difference in pain

prevalence between the two groups. This suggests that musculoskeletal pain is prevalent regardless of tobacco use, likely due to the ergonomic and occupational demands of dental practice rather than lifestyle factors like tobacco consumption.

In contrast, a study conducted among dentists in China revealed a significant association between smoking and musculoskeletal pain, with 19.1% of smokers reporting pain compared to 80.9% of non-smokers. Notably, pain prevalence was significantly higher among smokers (33.1%) than non-smokers (1.7%), suggesting that smoking may be a risk factor for musculoskeletal pain due to its negative effects on musculoskeletal health, such as reduced blood flow, impaired tissue healing, and increased inflammation.[36]

Table 52. Association of WMSDs with no of days of exercise each week

Our study revealed a significant association between exercise frequency and musculoskeletal pain, with participants exercising 5–6 days per week reporting the lowest pain prevalence (73.5%). In contrast, those exercising 1–2 days per week (97.6%) or never exercising (96.5%) had the highest pain prevalence. This suggests that regular exercise, particularly 5–6 days per week, may have a protective effect against musculoskeletal pain, likely due to improved muscle strength, flexibility, and overall physical resilience. Conversely, no exercise may exacerbate pain due to poor musculoskeletal conditioning and reduced ability to cope with occupational demands. These findings emphasize the importance of incorporating regular physical activity into the routines of dental professionals to mitigate the risk of musculoskeletal pain.

Similarly, a study conducted among Italian dentists found a trend toward significance between exercise frequency and pain. Participants who never exercised

reported a pain prevalence of 13.2%, while those exercising >10 hours per week had the lowest pain prevalence (10%).[22]

This aligns with our study's findings, suggesting that higher levels of physical activity may reduce musculoskeletal pain by enhancing physical resilience and mitigating the ergonomic strains of dental practice. However, the Italian study's lack of statistical significance indicates that other factors, such as occupational demands or individual ergonomic practices, may also play a significant role in pain development.

Both studies highlight the potential benefits of regular exercise in reducing musculoskeletal pain among dental professionals. While our study underscores the protective effect of exercising 5–6 days per week, the Italian study suggests that higher exercise volumes (>10 hours per week) may further reduce pain prevalence.

Table 53. Univariate Analysis of key variables

Our study revealed several significant associations between key variables and the presence of pain, highlighting potential risk and protective factors. Age emerged as a significant factor, with individuals aged 25–34 years showing substantially higher odds of pain compared to those aged ≤25 years, while those aged ≥55 years also demonstrated a significant association, although the odds ratio was undefined due to the absence of cases in the "No Pain" group.

Education level further influenced pain prevalence, as individuals with an MDS degree had significantly higher odds of pain compared to those with a BDS degree. Years of practice also played a role, with practitioners having 11–15 years and >15 years of experience exhibiting significantly higher odds of pain compared to those with less than 5 years of experience.

Additionally, hours spent at work were strongly associated with pain, as working 3–6 hours or >6 hours significantly increased the odds of pain compared to working fewer than 3 hours. On the other hand, exercise frequency appeared to have a protective effect, with individuals exercising 5–6 days per week showing significantly lower odds of pain compared to those exercising daily, while those who never exercised had significantly higher odds of pain.

These findings underscore the multifactorial nature of pain, with age, education, professional experience, work duration, and physical activity levels all contributing to its presence. The results suggest that targeted interventions, such as promoting regular exercise and managing work hours, could potentially mitigate pain prevalence, particularly among high-risk groups such as older individuals, highly educated professionals, and those with extensive work experience.

Similarly, A study conducted in Serbia among dentist, identifies several risk factors significantly associated with the occurrence of pain during work among dentists. Age was found to be a significant factor, indicating that older dentists had lower odds of experiencing pain compared to younger ones. Gender also showed a strong association, with females having significantly lower odds of pain compared to males. Years of working experience were inversely related to pain, with more experienced dentists having lower odds of pain. Higher BMI was also linked to increased odds of pain, highlighting the potential role of physical health in pain development. Specialty was another significant factor, with certain specialties associated with substantially higher odds of pain. Preferred working position, particularly sitting or standing, was also associated with pain. Additionally, the length of working time during the day were inversely associated with pain, with fewer working days and shorter working hours linked to lower odds of pain.[28]

Overall, the univariate analysis highlights that demographic factors, work-related practices, and ergonomic conditions significantly influence the likelihood of pain among dentists. These findings suggest that interventions targeting these factors, such as ergonomic improvements and workload management, could help reduce pain prevalence in this professional group.

Table 54. Multivariate Analysis (Logistic Regression) key variables.

The multivariate logistic regression analysis confirmed several key variables as significant predictors of pain after adjusting for potential confounders, reinforcing the findings from the univariate analysis. Age remained a critical factor, with individuals aged 25–34 years exhibiting significantly higher adjusted odds of pain compared to those ≤25 years, while those aged ≥55 years also showed a significant association, although the adjusted odds ratio was undefined due to the absence of cases in the "No Pain" group. Education level continued to influence pain prevalence, as individuals with an MDS degree had significantly higher adjusted odds of pain compared to those with a BDS degree. Years of practice also persisted as a significant predictor, with practitioners having 11–15 years and >15 years of experience demonstrating substantially higher adjusted odds of pain compared to those with less than 5 years of experience.

Hours spent at work were strongly associated with pain, as working 3–6 hours or >6 hours significantly increased the adjusted odds of pain compared to working fewer than 3 hours. Conversely, exercise frequency emerged as a protective factor, with individuals exercising 5–6 days per week showing significantly lower adjusted odds of pain compared to those exercising daily, while those who never exercised had significantly higher adjusted odds of pain. These findings highlight the multifactorial

nature of pain, with demographic, professional, and lifestyle factors all contributing to its presence.

Similarly, a study conducted among dentist of Jeddah, Saudi Arabia reported the multivariate logistic regression analysis identified key factors linked to work-related musculoskeletal disorders (WMSDs) among dentists. Gender played a significant role, with female dentists having 2.7 times higher odds of WMSDs compared to males. Age, and dental specialty did not show significant associations with WMSDs. Similarly, the number of hours worked per week (15–50 hours) did not significantly affect the likelihood of WMSDs.[23]

The consistency between the univariate and multivariate analyses underscores the robustness of these associations. The results suggest that targeted interventions, such as promoting regular exercise, optimizing work hours, and addressing ergonomic challenges, could help mitigate pain prevalence, particularly among high-risk groups such as younger individuals, highly educated professional.

CONCLUSION

- The study on the prevalence of Work-Related Musculoskeletal Disorders (WMSDs) among dental practitioners in Belagavi City revealed a high prevalence of musculoskeletal pain, with 91.4% of participants reporting such issues. The study identified several key contributing factors, including age, years of practice, working hours, and lack of regular exercise, which were significantly associated with the presence of WMSDs. Additionally, the study highlighted the underutilization of ergonomic tools and practices, such as dental loupes and ergonomic chairs, and the lack of awareness regarding posture and ergonomic training among dental practitioners.

- The findings align with global trends, indicating that WMSDs are a widespread issue in the dental profession, regardless of geographical location. The study also revealed that while musculoskeletal pain is prevalent across all age groups, specialties, and genders, certain factors such as regular exercise and ergonomic interventions could potentially mitigate the risk of WMSDs.

RECOMMENDATIONS

1. **Ergonomic Training and Awareness Programs**:

    - Dental institutions and workplaces should implement regular ergonomic training programs to educate practitioners about proper posture, the use of ergonomic tools, and the importance of taking scheduled breaks. This could help reduce the prevalence of WMSDs by promoting healthier work habits.

2. **Promotion of Regular Exercise**:

    - Dental professionals should be encouraged to engage in regular physical activity, particularly exercises that strengthen the core and improve flexibility. This could help reduce the risk of musculoskeletal pain and improve overall physical resilience.

3. **Workplace Interventions**:

    - Dental clinics should adopt ergonomic practices, such as providing ergonomic chairs, adjustable workstations, and magnification tools like dental loupes. Additionally, workplaces should encourage regular breaks and implement protocols to reduce the risk of WMSDs.

4. **Further Research**:

    - Future studies should explore the long-term impact of ergonomic interventions and exercise programs on reducing WMSDs among dental practitioners. Additionally, research should investigate the role

of psychological factors, such as stress and work-life balance, in the development of WMSDs.

5. **Policy Development**:

    - Policymakers should consider developing guidelines and regulations to ensure that dental workplaces adhere to ergonomic standards. This could include mandatory ergonomic assessments and the provision of ergonomic equipment in dental clinics.

STRENGTHS

1. **Comprehensive Data Collection:**

    - The study collected detailed data on various demographic, occupational, and lifestyle factors, providing a holistic view of the risk factors associated with WMSDs among dental practitioners.

2. **Large Sample Size:**

    - With 467 participants, the study had a robust sample size, enhancing the reliability of the findings.

3. **Multivariate Analysis:**

    - The use of multivariate logistic regression allowed for the identification of key predictors of WMSDs, adjusting for potential confounders and providing a more accurate assessment of Key factors.

LIMITATIONS

1. The study was conducted in a single city, which may limit the generalizability of the findings to broader populations.

2. Since all data on pain were self-reported, variations in pain perception among participants could introduce potential measurement bias.

SUMMARY

The study titled "**Prevalence of Work-Related Musculoskeletal Disorders Among Dental Practitioners in Belagavi City**" investigates the widespread issue of musculoskeletal disorders (WMSDs) among dental professionals, focusing on the local context of Belagavi, India. Dental practitioners are particularly susceptible to WMSDs due to prolonged static postures, repetitive movements, and poor ergonomic conditions. While global research highlights high prevalence rates, localized data from regions like Belagavi remain limited. This study aimed to determine the prevalence of WMSDs and identify associated socio-demographic and occupational factors.

A cross-sectional design was employed, involving 467 dental practitioners, including faculty members, postgraduate students, and private practitioners. Data were collected using a validated questionnaire incorporating the Extended Nordic Musculoskeletal Questionnaire (NMQ-E), with statistical analysis performed using descriptive methods, chi-square tests, and multivariate logistic regression. The findings revealed a strikingly high prevalence of WMSDs (91.4%), with the neck (38.2%) and lower back (35.1%) being the most commonly affected areas. Significant associations were found between WMSDs and factors such as increasing age (100% prevalence among those ≥55 years), greater professional experience (97.5% in practitioners with over 15 years of practice), extended working hours (94.2% among those working more than 6 hours daily), and physical inactivity (96.5% in non-exercising individuals). Alarmingly, only 41.3% of respondents reported receiving ergonomic training during their education, and less than half used ergonomic chairs (42.6%).

The study's results align with global trends, emphasizing that WMSDs are a critical occupational hazard in dentistry. The high prevalence among older and more experienced practitioners suggests cumulative occupational strain, while the protective effect of regular exercise highlights the importance of physical activity in mitigating WMSDs. The lack of ergonomic awareness and training underscores a significant gap in dental education and practice. Recommendations include implementing ergonomic training programs, promoting workplace modifications (e.g., ergonomic chairs, scheduled breaks), encouraging regular exercise, and developing policies to enforce ergonomic standards in dental clinics. Strengths of the study include its robust sample size and comprehensive data collection, though limitations such as its single-city focus and reliance on self-reported data may affect generalizability.

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ANNEXURES

ANNEXURE – I - INFORMED CONSENT FORM

"PREVALENCE OF WORK-RELATED MUSCULOSKELETAL DISORDERS AMONG DENTAL PRACTITIONERS IN BELAGAVI CITY"

Introduction:

Work-related musculoskeletal disorders (WMSDs) are a group of painful disorders of muscles, tendons, and nerves caused due to work load related to occupation.

World Health organization (WHO) considering the impact of Work-related musculoskeletal disorders WMSDs has characterized as multi factorial, indicating that a number of risk factors contribute to and exacerbate these maladies. The presence of these risk factors produced an increase in the occurrence of these injuries, thus making WMSDs an international health concern. Hence to know the prevalence Work-related musculoskeletal disorders WMSDs we are conducting the study.

Explanation of procedure: Questionnaire regarding Work-related musculoskeletal disorders will be given to the participant, he/she will be asked to mark the appropriate answer and the same will be documented in this study.

Withdrawal from participation in the study: Participation in this study in 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 not get any benefits by participating in this study. The data gathered will help 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 to identify 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 purpose 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: BD0122009.

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 **"PREVALENCE OF WORK-RELATED MUSCULOSKELETAL DISORDERS AMONG DENTAL PRACTITIONERS IN BELAGAVI CITY".** 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:

ANNEXURE – II

QUESTIONNAIRE

QUESTIONNAIRE ON WORK-RELATED MUSCULOSKELETAL DISORDERS

TITLE: -Work-related musculoskeletal disorders among dental practitioners in Belagavi City

Sl. No: _____
Date:_____

A. Socio demographic details:

1] Name : _____

2] Age : ____ years

3] Education qualification i) BDS ii) MDS

iii)Others Specify: _____

4] Speciality (if MDS) _____

5] Sex i) Male ii) Female

6] Religion i) Hindu ii) Muslim iii) Christian iv) Jain

v) others, specify_____

7] Marital status i) Married ii) Un-married iii) Divorced

8]Type of family i) Nuclear ii) Joint iii) Three generation

B. Details related to dental practices:

9] Are you currently Practicing Dentistry? i) Yes – skip to Q 11 ii) No

10] What is the main reason you are not practicing?

i) Musculoskeletal Problem due to dental practices.

ii) Others, specify……..

(if you are not working, please base your answers on your most recent clinical practice history)

11] Are you right-handed or left-handed? **1 Right-handed** ☐

2 Left-handed ☐

12] How many years and months have you been doing your present type of work?

_____Years + _____Months

13] Have you had extended break periods from clinical practice?

i) If Yes _____months _____Years

ii) No ☐

14] Using the table please indicate how many clinical hours each day you work in dental practice?

DAY	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Hours							

15] Do you have scheduled break times when you work in clinical practice?

i) Yes ☐

No of Breaks	Time (minutes)
1	
2	
3	
4	

ii) No ☐

16] How many patients do you see on an average day? _____

17] How do you predominantly work in clinical practice?

i) Always seated ☐

ii) Mostly seated, sometimes standing ☐

iii) Mostly standing, sometimes seated ☐

iv) Always standing ☐

18] Do you regularly use dental loupes for magnification while working clinically?

i) Yes ☐

ii) No ☐

19] Are you aware of your posture while understanding clinical procedures?

i) Always ☐

ii) Most of the time ☐

iii) Sometimes ☐

iv) Never ☐

20] Do you regularly use an ergonomic chair (e.g. saddle chair) while working?

i) Yes ☐ **ii) No** ☐

21] How would you rate your Posture while undertaking clinical procedure?

i) Very good ☐

ii) Good ☐

iii) Average ☐

iv) Poor ☐

22] Do you practice regular muscle stretches throughout a normal working day?

i)Yes ☐ **ii)No** ☐

23] Did you receive any training or education in relation to ergonomics while studying at university?

i)Yes ☐ **ii)No** ☐

24] How would you rate the following aspects of life in regard to the level of stress experienced on a daily basis:

(1- no stress;10-high stress)

Situation/environment	**Stress level** **(1-10)**
Personal (e.g. family, friend conflicts, house hold, jobs)	
Work (e.g. emergencies)	
Financial (e.g. mortgage, bills)	

25] How many days do you exercise each week?

i) Everyday ☐

ii) 5-6 days ☐

iii) 3-4 days ☐

iv) 1-2 days ☐

v) Never (if never Please go to question number 27) ☐

26] How long do you spend exercising each week?

_____hours

_____minutes

27] Do you have any medical conditions that limit your ability to undertake regular exercise?

i) Yes ☐ **ii) No** ☐

28] Do you practice any form of meditation or relaxation therapy?

i) Yes ☐ **ii) No** ☐

29] Do you have a current protocol or have any changes been implemented in your workplace in an effort to reduce work related musculoskeletal disorders?

i) Yes ☐ (if yes, answern30 and skip to section C)

ii) No ☐ (if no skip to question 31)

30] if there is a protocol or changes have been implemented, has this improved the ergonomics of the work environment?

i) Great improvement ☐

ii) Slight improvement ☐

iii) No improvement ☐

iv) Unsure ☐

31] If it were provided, do you think information or training regarding improved ergonomics in the workplace would be useful?

i) Yes ☐ ii) No ☐

C. Personal Habits:

32] Alcohol consumption

i) Yes ☐ ii) No ☐

If yes, specify amount of intake _____ml

Frequency i) everyday ☐ ii) once a week ☐ iii) once in a month ☐ iv) ☐ occasionally

33] Tobacco consumption

i) Yes ☐ ii) No ☐

If yes specify

Type of tobacco – i) Smoking ☐ ii) smokeless ☐ iii) Combined ☐

Amount of intake_____

Frequency i) everyday ☐ ii) once a week ☐ iii) once in a month ☐ iv) occasionally

D. Examination findings :

34]Height _____cms

35]Weight _____kg

36]BMI _____kg/m^2

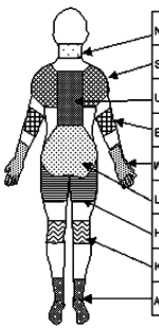
D. Nordic questionnaire

37) please complete the following table by marking the appropriate box for each question. Please answer each one even if you have never had any trouble in any part of your body. The picture shows how the body has been divided. You should decide which part (if any) is or has been affected.

Extended Nordic Musculoskeletal Questionnaire (NMQ-E)

How to answer the questionnaire:

Please answer by putting a cross in the appropriate box - one cross for each question. Answer every question, even if you have never had trouble in any part of your body. Please answer questions from left to right before going down to the next body region. This picture shows how the body has been divided. Limits are not sharply defined and certain parts overlap. You should decide for yourself which part (if any) is or has been affected.



	Have you **ever** had trouble (ache, pain or discomfort) in:	**If 'No', go on to the next body region. If 'Yes', please continue**	At the time of initial onset of the trouble, what was your age?	Have you **ever** been hospitalised because of the trouble?	Have you **ever** had to change jobs or duties (even temporarily) because of the trouble?	Have you had trouble (ache, pain, discomfort) at any time during the **last 12 months?**	**If 'No', go on to the next body region. If 'Yes', please continue**	Have you had trouble (ache, pain, discomfort) at any time during the **last month (4 weeks)?**	Have you had trouble (ache, pain, discomfort) **today?**	During the **last 12 months** have you at any time:			
										been prevented from doing your normal work (at home or away from home) because of the trouble?	seen a doctor, physio-therapist, chiropractor or other such person because of the trouble?	taken medication because of the trouble?	taken sick leave from work/studies because of the trouble?
NECK	◻ No ◻ Yes		___ years	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes		◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes
SHOULDERS	◻ No ◻ Yes		___ years	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes		◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes
UPPER BACK	◻ No ◻ Yes		___ years	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes		◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes
ELBOWS	◻ No ◻ Yes		___ years	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes		◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes
WRISTS/ HANDS	◻ No ◻ Yes		___ years	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes		◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes
LOW BACK	◻ No ◻ Yes		___ years	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes		◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes
HIPS/ THIGHS	◻ No ◻ Yes		___ years	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes		◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes
KNEES	◻ No ◻ Yes		___ years	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes		◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes
ANKLES/ FEET	◻ No ◻ Yes		___ years	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes		◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes	◻ No ◻ Yes

Thank you for your time and Participation