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Original Article

Prosthetic Status and Prosthetic Needs of Geriatric Population of Meerut – A Cross-sectional Study

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Abstract

Aims and Objectives: The aim of the study was to assess the community's level of edentulousness, prosthetic status, and needs in the community and to study the correlation between oral health parameter and socioeconomic status (SES).

Materials and Methods: A cross-sectional survey was carried out among the geriatric population with seniors 60 years of age and older. A sample size of 600 was estimated. Data were collected using the WHO Oral Health Assessment Form 1997 to determine the prosthesis status and requirement. The data were analyzed using the Chi-square test.

Results: Out of 600 elderly participants, 280 were males and 320 were females. Among males, 75.4% had no prosthesis in the upper arch, and 83.5% had none in the lower arch, while 78% of females had no prosthesis in the upper arch and 85.7% in the lower arch. The need for a full prosthesis was higher among males (37% upper arch, 42% lower arch) compared to females (19% upper arch, 25% lower arch). The study revealed that 23% of participants did not need an upper arch prosthesis, and 15% did not need a lower arch prosthesis. Overall, 77% required prostheses in both arches, with a higher percentage of lower SES participants needing prostheses.

Conclusion: Geriatric patients visiting the institutional outpatient department showed higher rates of unmet prosthetic needs, with age and SES significantly impacting prosthetic status and need, while gender did not. The study's analysis highlights the complex interplay of these factors, offering valuable insights for developing interventions to improve oral health outcomes in the elderly.

Key words: Geriatric populations, Prosthetic needs, Prosthetic status, Socioeconomical status and oral health

INTRODUCTION

Oral health is a vital aspect of overall health in older adults and serves as an indicator of their overall well-being and quality of life.[1] Rehabilitation in this field is essential for reducing impairments since dental health is a key component of a healthy existence.[2] Tooth loss is primarily caused by periodontal disease and dental caries, influenced by oral hygiene habits, age, gender, and lifestyle choices such as diet, smoking, and alcohol use.[3]

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According to the World Health Organization (WHO), oral health indicators include the absence of pain, infections, and diseases affecting one's ability to bite, eat, smile, and speak, which are crucial for psychological well-being.[4,5] Oral diseases can impact overall health, affecting speech, food intake, and self-esteem. Research highlights connections between poor oral health and systemic ailments such as diabetes, heart disease, and pneumonia.[6] Major oral health issues, including oral cancer, periodontal disease, and dental caries, affect many globally.[7] Aging naturally challenges oral health, especially in seniors over 65, who often face multiple health issues and are vulnerable to oral diseases due to medication-induced hyposalivation.[8] Addressing the oral health needs of the elderly, especially regarding prosthetic therapy, is crucial for maintaining their overall health and quality of life.

Several sociodemographic characteristics, including socioeconomic status (SES), education, smoking and

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drinking habits, oral hygiene routines, attitudes toward oral health, and dentist behavior influence the oral health of the older population.[9] Oral diseases cause loss of teeth and this shows a negligent attitude of the patients in maintaining proper oral hygiene, the prevalent dental care philosophy, furthermore, accessibility and availability of dental care.[10] Since tooth loss is a key indicator of a population's oral health, several nations keep an eye on it. Even though it is preventable, dental caries and periodontal illnesses that go untreated can cause tooth loss, which is extremely frequent in underdeveloped nations like India.[11]

MATERIALS AND METHODS

A cross-sectional study was conducted to assess the prevalence of edentulism, as well as the prosthetic status and needs of geriatric patients attending the dental outpatient department at the Department of Prosthodontics, Kalka Dental College, Meerut. A sample size of 600 participants was collected.

Inclusion Criteria

- Participants aged 60 years and above
- Participants willing to provide signed consent
- Participants residing in Meerut city.

Exclusion Criteria

- Participants who do not agree to provide informed consent
- Participants who do not reside in Meerut city.

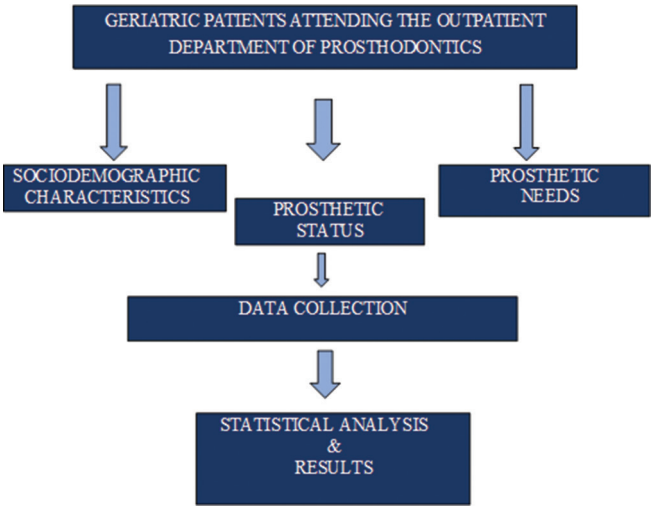
Discontinuation Criteria

- Participants who do not agree to provide informed consent.

Data collection was performed using a pretested Performa. The armamentarium used included mouth mirrors, probes, kidney trays, mouth masks, and disposable gloves. Data collection was conducted by a single investigator. All subjects were examined while seated in a dental chair with appropriate lighting.

The study had two parts: The first part involved recording sociodemographic factors (e.g., name, sex, and age) and assessing the SES of the patients using the Kuppuswamy classification.[3] The second part utilized a section of the WHO Oral Health Assessment Form to record the prosthetic status and prosthetic needs of the patients.[2] Examinations were conducted by a single investigator using standard dental equipment.

Consort Diagram [Flow chart 1].



Flow chart 1: Consort Diagram (Study Design)

Statistical Analysis

Data were analyzed using SPSS version 22.0 (SPSS Inc., Chicago, IL). Descriptive statistics assessed the proportions of each category in the respective groups. Normality was assessed using the Shapiro–Wilkinson test. Inferential statistics, using the Chi-square test, determined associations between groups. The significance level was set at $P < 0.05$.

RESULTS

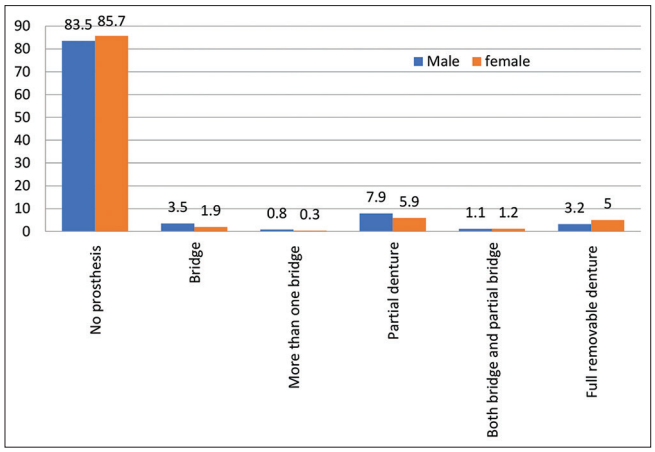
This study examines the prosthetic status and prosthetic needs of elderly patients visiting the outpatient prosthodontics department at Kalka Dental College in Meerut. A total of 600 research subjects, all aged 60 and above, were included in the study. Of these participants, 53% were female and 47% were male.

Prosthetic Status Based on Gender

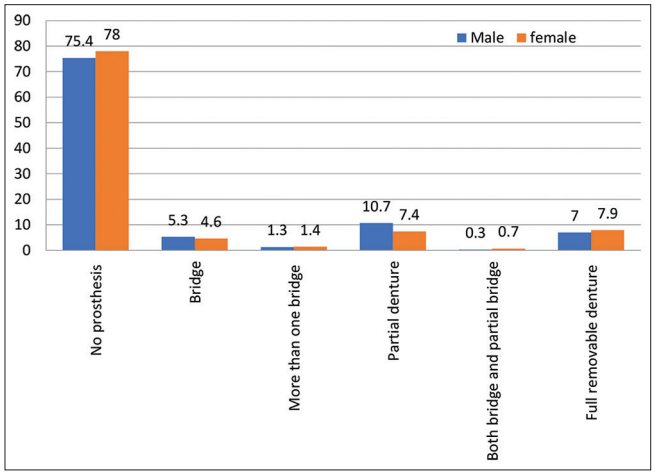
Graphs 1 and 2 show the distribution of lower and upper arch prosthetic status among male and female participants. In the lower arch, 83.5% of males and 85.7% of females did not use any prosthesis [Table 1]. For the upper arch, 75.4% of males and 78.0% of females had no prosthetic appliance [Table 2]. Statistical analysis ($P = 0.82$ for the lower arch, $P = 0.98$ for the upper arch) revealed no significant gender differences in prosthetic status.

Prosthetic Needs Based on Gender

Tables 3 and 4 show the distribution of prosthetic needs by gender. In the lower arch, 42.9% of males and 40.7% of females required full-mouth prostheses. In the upper arch, 37.1% of males and 35.1% of females needed full-mouth prostheses. Chi-square tests indicated no significant correlation between gender and prosthetic needs ($P > 0.05$).



Graph 1: Distribution of study subjects according to gender and prosthetic status of their lower arch



Graph 2: Distribution of study subjects according to gender and the prosthetic status of their upper arch

Table 1: Distribution of study subjects according to gender and prosthetic status of their lower arch.

Prosthetic status	Male	female	Total	P value
No prosthesis	234(83.5%)	274(85.7%)	508	0.82
Bridge	10(3.5%)	6(1.9%)	16	
More than one bridge	2(0.8%)	1(0.3%)	3	
Partial denture	22(7.9%)	19(5.9%)	41	
Both bridge and partial bridge	3(1.1%)	4(1.2%)	7	
Full removable denture	9(3.2%)	16(5%)	25	
Total	280(100%)	320(100%)	600	

Prosthetic Status Based on Age

Tables 5 and 6 show the prosthetic status across different age groups in the upper and lower arches. Table showed that older age groups (70–75 and 75–80) had higher percentages of participants with prosthetic appliances, indicating a correlation between age and prosthetic status ($P = 0.0001$ for both lower and upper arches).

Table 2: Distribution of study subjects according to gender and the prosthetic status of their upper arch

Prosthetic status	Male	female	Total	P value
No prosthesis	240(75.4%)	220(78.0%)	460	0.98
Bridge	17(5.3%)	13(4.6 %)	30	
More than one bridge	4(1. 3%)	4(1.4%)	8	
Partial denture	34(10.7%)	21(7.4%)	55	
Both bridge and partial bridge	1(0.3%)	2(0.7%)	3	
Full removable denture	22(7.0%)	22(7.9%)	44	
Total	318(100%)	282(100%)	600	

Prosthetic Requirements Based on Age

Tables 7 and 8 show the distribution of prosthetic needs by age group. Participants aged 60–65 showed the highest demand for both single-unit and multi-unit prostheses in both lower and upper arches. Significant differences were noted across age groups ($P < 0.05$), suggesting varying prosthetic needs with age.

Prosthetic Status Based on SES

Tables 9 and 10 depict the prosthetic status based on SES. Lower middle-class participants had the highest percentage needing prostheses in both lower and upper arches, whereas upper-class participants showed lower prosthetic requirements. Statistically significant differences were found across SES groups (p=0.0001).

Prosthetic Requirements Based on SES

Tables 11 and 12 outline the prosthetic requirements by SES. Notably, the lower middle class and upper lower class showed higher demands for full-mouth prostheses compared to other SES groups. Significant differences were observed in prosthetic requirements across SES categories ($P < 0.05$).

DISCUSSION

India's ageing population, with over 77 million elderly citizens, faces significant oral health challenges, including tooth loss, periodontal disease, and dental caries. The elderly, particularly those in nursing homes, often experience unmet prosthetic needs due to their dependency.[12] Surveys show that elderly dentate use dental procedures less frequently than other age groups, largely driven by their perceived need for care. The homebound elderly, often women, are particularly vulnerable, facing multiple long-term illnesses and requiring assistance to leave their homes.[13]

SES directly impacts dental health, affecting appearance, speech, mastication, self-esteem, and self-image. Tooth loss

Table 3: Distribution of study subjects according to gender and the prosthetic need of their lower arch

Prosthetic need	Male (%)	Female (%)	Total	*P*-value
No prosthesis required	46 (16.4)	46 (14.3)	92	0.38
Need for single unit prosthesis	32 (11.5)	40 (12.5)	72	
Need for multi-unit prosthesis	70 (25)	80 (25)	150	
Needs for the combination of single or multi-unit prosthesis	12 (4.2)	24 (7.5)	36	
Need for full mouth prosthesis	120 (42.9)	130 (40.7)	250	
Total	280 (100)	320 (100)	600	

*$P<0.05$ is statistically significant (Chi-square test)

Table 4: Distribution of study subjects according to gender and the prosthetic need of their upper arch

Prosthetic needs	Male (%)	Female (%)	Total	*P*-value
No prosthesis required	78 (24.5)	62 (22)	140	0.97
Need for single unit prosthesis	29 (9.1)	24 (8.5)	53	
Need for multi-unit prosthesis	79 (24.9)	79 (28)	158	
Needs for the combination of single or multi-unit prosthesis	14 (4.4)	18 (6.4)	32	
Need for full mouth prosthesis	118 (37.1)	99 (35.1)	217	
Total	318 (100)	282 (100)	600	

*$P<0.05$ is statistically significant (Chi-square test)

Table 5: Distribution of prosthetic status of the study subjects according to age of lower arch

Lower arch	60–65 (%)	65–70 (%)	70–75 (%)	75–80 (%)	80–85 (%)	85–90 (%)	Total	*P*-value
No prosthesis	220 (76.1)	80 (57.5)	47 (48.5)	24 (68.5)	12 (54.5)	8 (44.4)	391	0.0001*
Bridge	14 (4.9)	15 (10.8)	12 (12.4)	0	0	0	41	
More than one bridge	12 (4.1)	14 (10.1)	9 (9.2)	0	0	0	35	
Partial denture	20 (7)	13 (9.3)	12 (12.4)	5 (14.3)	8 (36.4)	8 (44.4)	64	
Both bridge and partial bridge	8 (2.7)	7 (5.1)	5 (5.1)	0	0	0	20	
Full removable denture	15 (5.2)	10 (7.2)	12 (12.4)	6 (17.2)	2 (9.1)	2 (11.2)	49	
Total	289 (100)	139 (100)	97 (100)	35 (100)	22 (3)	18 (3)	600	

*$P<0.05$ is statistically significant (Chi-square test)

Table 6: Distribution of prosthetic status of the study subjects according to age of upper arch

Upper arch	60–65 (%)	65–70 (%)	70–75 (%)	75–80 (%)	80–8 (%) 5	85–90 (%)	Total	*P*-value
No prosthesis	252 (80.5)	115 (77.2)	52 (67.5)	22 (68.8)	14 (73.7)	6 (60)	461	0.0001*
Bridge	17 (5.4)	6 (4.1)	7 (9.1)	0	0	0	30	
More than one bridge	3 (0.9)	3 (2)	2 (2.5)	0	0	0	8	
Partial denture	26 (8.3)	16 (13.9)	10 (12.9)	2 (6.3)	1 (5.3)	1 (10)	56	
Both bridge and partial bridge	1 (0.3)	1 (0.7)	1 (1.3)	0	0	0	3	
Full removable denture	14 (5.5)	8 (2.1)	5 (6.7)	8 (24.9)	4 (21)	3 (30)	42	
Total	313 (100)	149 (100)	77 (100)	32 (100)	19 (100)	10 (100)	600	

*$P<0.05$ is statistically significant (Chi-square test)

Table 7: Distribution of prosthetic needs of the study subjects according to age – lower of lower arch

Lower arch	60–65 (%)	65–70 (%)	70–75 (%)	75–80 (%)	80–85 (%)	85–90 (%)	Total	*P*-value
No prosthesis required	69 (23.8)	59 (42.5)	50 (51.6)	11 (31.4)	10 (45.4)	10 (55.5)	209	0.0001*
Need for single unit prosthesis	60 (20.7)	10 (7.1)	5 (5.1)	0	0	0	75	
Need for multi-unit prosthesis	98 (34)	25 (18)	9 (9.3)	7 (20)	0	0	139	
Need for the combination of single and multi-unit prosthesis	16 (5.5)	12 (8.6)	2 (2.0)	0	0	0	30	
Need for full mouth prosthesis	46 (16)	33 (23.8)	31 (32)	17 (48.6)	12 (54.6)	8 (44.5)	147	
Total	289 (100)	139 (100)	97 (100)	35 (100)	22 (100)	18 (100)	600	

*$P<0.05$ is statistically significant (Chi-square test)

in the elderly can lead to dietary changes and nutritional deficiencies, influencing normal activities such as eating, speaking, and laughing. Replacing missing teeth with dentures improves masticatory efficiency, while being underweight is linked to not having natural or artificial teeth.[2]

Table 8: Distribution of prosthetic needs of the study subjects according to age – upper of upper arch

Upper arch	60–65 (%)	65–70 (%)	70–75 (%)	75–80 (%)	80–85 (%)	85–90 (%)	Total	*P*-value
No prosthesis required	61 (19.4)	34 (22.9)	25 (32.5)	10 (31.3)	5 (26.3)	4 (40)	139	0.0001*
Need for single unit prosthesis	27 (8.7)	26 (17.4)	8 (10.4)	0	0	0	61	
Need for multi-unit prosthesis	115 (36.8)	23 (15.5)	9 (11.7)	9 (28.1)	0	0	156	
Need for the combination of single and multi-unit prosthesis	14 (4.4)	10 (6.7)	0	0	0	0	24	
Need for full mouth prosthesis	96 (30.7)	56 (37.5)	35 (45.4)	13 (40.6)	14 (73.7)	6 (60)	220	
Total	313 (100)	149 (100)	77 (100)	32 (100)	19 (100)	10 (100)	600	

*$P<0.05$ is statistically significant (Chi-square test)

Table 9: Distribution of prosthetic status of the study subjects according to SES of lower arch

Lower arch	Upper (%)	Upper middle (%)	Lower middle (%)	Upper lower (%)	Lower (%)	Total	*P*-value
No prosthesis	40 (46.5)	190 (87.1)	180 (87)	40 (70.2)	15 (62.5)	465	0.0001*
Bridge	18 (20.9)	3 (1.4)	2 (0.9)	0	0	23	
More than one bridge	4 (4.7)	0	0	0	0	4	
Partial denture	1 (1.2)	0	0	0	0	1	
Both bridge and partial bridge	13 (15.1)	13 (5.9)	13 (6.3)	10 (17.6)	4 (16.6)	58	
Full removable denture	10 (11.6)	12 (5.6)	12 (5.8)	7 (12.2)	5 (20.8)	49	
Total	86 (100)	218 (100)	207 (100)	57 (100)	24 (4)	600	

*$P<0.05$ is statistically significant (Chi-square test), SES: Socioeconomic Status

Table 10: Distribution of prosthetic status of the study subjects according to SES of upper arch

Upper arch	Upper (%)	Upper middle (%)	Lower middle (%)	Upper lower (%)	Lower (%)	Total	*P*-value
No prosthesis	39 (45.8)	191 (85.2)	179 (84.9)	33 (67.4)	19 (61.2)	461	0.0001*
Bridge	16 (18.9)	9 (4.1)	5 (2.3)	0	0	30	
More than one bridge	6 (7.1)	2 (0.9)	0	0	0	8	
Partial denture	2 (2.3)	0	0	0	0	2	
Both bridge and partial bridge	14 (16.4)	11 (4.9)	14 (6.6)	9 (18.4)	8 (25.8)	56	
Full removable denture	8 (9.4)	11 (4.9)	13 (6.2)	7 (14.2)	4 (13)	43	
Total	85 (100)	224 (100)	211 (100)	49 (100)	31 (100)	600	

*$P<0.05$ is statistically significant (Chi-square test), SES: Socioeconomic Status

Table 11: Distribution of prosthetic needs of the study subjects according to SES of lower arch

Lower arch	Upper (%)	Upper middle (%)	Lower middle (%)	Upper lower (%)	Lower (%)	Total	*P*-value
No prosthesis required	46 (53.4)	36 (16)	27 (13.1)	17 (29.9)	9 (37.5)	135	0.0001*
Need for single unit prosthesis	14 (16.2)	18 (8)	20 (9.6)	12 (21.1)	5 (20.9)	69	
Need for multi-unit prosthesis	16 (18.6)	66 (29.1)	41 (19.9)	18 (31.5)	7 (29.1)	148	
Need for the combination of single and multi-unit prosthesis	5 (5.9)	7 (3.1)	9 (4.3)	4 (7.0)	2 (8.3)	27	
Need for full mouth prosthesis	5 (5.9)	99 (43.8)	110 (53.1)	6 (10.5)	1 (4.2)	221	
Total	86 (14.3)	226 (100)	207 (100)	57 (100)	24 (100)	600	

*$P<0.05$ is statistically significant (Chi-square test), SES: Socioeconomic Status

Table 12: Distribution of prosthetic needs of the study subjects according to SES

Upper arch	Upper (%)	Upper middle (%)	Lower middle (%)	Upper lower (%)	Lower (%)	Total	*P*-value
No prosthesis required	46 (54.1)	33 (14.7)	32 (15.2)	16 (32.7)	12 (38.8)	139	0.0001*
Need for single unit prosthesis	13 (15.2)	20 (9)	13 (6.2)	3 (6.1)	1 (3.2)	50	
Need for multi-unit prosthesis	15 (17.7)	76 (34)	61 (29)	10 (20.4)	7 (22.5)	169	
Need for combination of single and multi-unit prosthesis	0	12 (5.3)	1 (0.4)	3 (6.1)	0	16	
Need for full mouth prosthesis	11 (13)	83 (37.0)	104 (49.2)	17 (34.7)	11 (35.5)	226	
Total	85 (100)	224 (100)	211 (100)	49 (100)	31 (100)	600	

*$P<0.05$ is statistically significant (Chi-square test), SES: Socioeconomic Status

A study at Kalka Dental College, Meerut, assessed edentulism, prosthetic status, and needs among 600 geriatric patients using a pretested Performa. Results showed a significant lack of prostheses, with no gender

differences in prosthetic status. Lower socioeconomic groups had higher unmet prosthetic needs, emphasizing the need to raise awareness about prosthetic treatment and improve access to dental care for the elderly.

In 75.4% of male and 83.5% of female participants, prostheses were lacking in their upper or lower arches. In addition, 78% of males and 85.7% of females lacked prostheses in either arch, with no significant gender difference in lower ($P = 0.82$) or upper ($P = 0.98$) arch prosthetic status [Graphs 1 and 2]. The low usage may be due to ignorance, lack of funds, and mobility issues. Misconceptions about dentures and a lack of interest in appearance also contribute. This result was in line with Soh *et al.*'s Findings.[12] Males had somewhat higher prosthetic status than females, according to another survey. Women, relying on men for appointments and facing educational and employment disparities were more likely to be edentulous.

The most common need for both genders was for a complete prosthesis, followed by multi-unit prosthetics in the lower arch. Females showed higher prosthetic needs compared to males [Tables 3 and 4], aligning with findings by Chaware and Chaware.[14] This could be due to factors such as lower education, limited dental care access, and dependence on male relatives for appointments. This is similar to Shenoy and Hegde's study in Mangalore's geriatric homes.[1] Patient demand for prostheses was lower than their actual need, and clinical options often differed from patient desires. Women required more prosthetics in the lower arch (85%) compared to men (83%), but the difference between genders for maxillary and mandibular arches was not statistically significant.[15]

The study found a direct relationship between age and prosthesis status. Tables 5 and 6 show the prosthetic state by age. In the lower arch, 65% had no prosthesis: 56% were aged 60–65, 20% were 65–70, and 12% were 70–75. In the upper arch, 77% lacked prostheses: 55% were 60–65, 25% were 65–70, and 11% were 70–75. Significant disparities were noted ($P = 0.000$ for lower, $P = 0.0001$ for upper). Elderly patients often delay prosthetic care due to learned patterns or economic conditions. In the 70–75 age group, 32% had lower arch prosthetics and 51% had upper arch prosthetics. Among those aged 75–80, 31% had prosthetics in both arches. Similar findings by Pavan *et al.*[16] suggest partially edentulous individuals have a lower desire for prosthetic care.

In the lower arch, 35% of participants did not need prostheses, with 33% aged 60–65 and 28.3% aged 65–70. Of the 65% needing prosthetics, 15% required a single unit and 25% a multi-unit, primarily aged 60–65. In the upper arch, 23% did not need prostheses, with 44% aged 60–65, 24% aged 65–70, and 18% aged 70–75. Significant age-based differences were found ($P = 0.0001$ for both arches). The 80–85 age groups was more likely to need complete removable dentures (30% in both arches). Prosthetic needs [Tables 7 and 8] increase with age, similar to findings by Hamasha *et al.*[17] and George *et al.*[18] Tooth loss in the elderly causes malnutrition, emotional stress, and psychological inferiority, highlighting the importance of prosthetic rehabilitation for their overall quality of life.

In a study, 77% of participants required prostheses in both upper and lower arches. Full mouth prosthesis demand was highest in the lower arch among the upper (21%) and lower middle classes (23%), and in the upper arch among the lower middle (22%) and upper middle classes (18%). Both upper and lower-middle-class individuals needed multi-unit prostheses in the lower arch. SES significantly impacted prosthetic needs in both arches ($P = 0.0001$). Higher socioeconomic groups demonstrated better dental care awareness, likely due to social pressures and more frequent dental visits. Studies by Hanson *et al.*[19] and Eklund and Burt[20] support that higher SES groups maintain better dental health.

According to Hanson *et al.*,[19] a person's interpersonal relationships and social support system significantly correlate with specific elements of their oral health. In addition, there is a correlation between dental status and socioeconomic class, enhancing our understanding of dental health. My study highlights stark contrasts among Indian geriatric patients due to varying financial statuses, living conditions, eating habits, social classes, and work ethics, resulting in significant differences in prosthetic status and needs compared to Hanson's study on elderly Swedish men.

Hameed *et al.* found no gender variation in prosthetic status in Peshawar. However, my research shows significant gender differences in prosthetic status ($P > 0.05$), contrasting with their findings.[21] Joseph *et al.*[22] study in Aluva, India, indicated prosthetic needs exceed the status among the elderly. In contrast, my study suggests the prosthetic status of individuals outweighs their needs.[22]

Assessing prosthetic treatment needs is crucial for identifying unmet oral health care requirements and implementing changes to improve public oral health. A comprehensive evaluation ensures dental professionals efficiently use their resources to enhance community health.

CONCLUSION

The concept of health has transformed from a personal issue to a global societal objective that includes quality

of life factors such as health, happiness, education, social and intellectual accomplishments, freedom, justice, and expression. This cross-sectional study assessed edentulism, prosthetic status, and community needs among 600 senior patients at Kalka Dental College, Meerut, using the WHO Oral Health Assessment Form 1997 and Chi-square analysis. The findings revealed no significant gender differences in prosthetic status for upper and lower arches although males generally had a higher percentage of prostheses. Females exhibited higher prosthetic status and needs. Older patients (70+ years) had more prostheses, while the 60–65 age groups had the highest demand for multi-unit and full-mouth prostheses.

SES significantly influenced prosthetic needs, with 21% of higher and 23% of lower middle classes needing complete mouth prostheses in the lower arch, and 18% of upper middle and 22% of lower middle classes in the upper arch. Higher socioeconomic groups demonstrated better attitudes and awareness toward dental care. These results provide a baseline for future larger-scale evaluations of prosthetic status and requirements in the population.

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