

Burden Of Oral Diseases Among Children And Early Adolescents Belonging To Upper And Lower Middle Class Schools

Abeeha Batool Zaidi¹, Sidra Mohiuddin², Nazish Fatima³, Tauseef Ahmed⁴,
Arifa Haque⁵, Afshan Qamar⁶

Abstract

Objective: This study aimed to determine the burden of oral health parameters such as dental caries, dental plaque, gingivitis, periodontitis, mouth opening, and dental fluorosis among children and early adolescents belonging to upper and lower-middle-class private schools of Karachi

Methods: A cross-sectional study with 550 study subjects was conducted among schools to assess dental caries, the presence of dental plaque, gingivitis, dental fluorosis, and mouth opening. The sample was selected through a nonprobability sampling technique. The inclusion criteria were male and female students from class 6 to class 10, students present on the day of the examination, and students given verbal consent for the study; the exclusion criteria included students with dental anomalies such as amelogenesis imperfecta, dentinogenesis imperfecta, supernumerary teeth, congenitally absent teeth or teeth missing due to fracture or trauma. An open epi was used to calculate the sample size. The study was performed in private schools belonging to various localities near Ziauddin University. Dental examination was carried out using a disposable dental examination kit. SPSS version 20 was used for data analysis, and the nonparametric Mann-Whitney test was used to analyse the variables.

Results: The mean age of the study sample is 12.96 ± 2.30 , the mean DMFT (Decayed missing and filled tooth) score is 1.07 ± 2.04 , the mean plaque score is 0.38 ± 0.90 , and the gingival index is 0.21 ± 0.79 , the mean mouth opening is 36.16 ± 8.65 . The gender-wise distribution of oral health parameters presented the statistically significant difference in mean mouth opening among male and female study subjects $p < 0.0001$, whereas mean decayed tooth and mean DMFT scores were statistically insignificant $p < 0.44$ and $p < 0.36$, respectively. The comparison of oral health parameters of study subjects among upper and lower class shows statistically significant differences among mean mouth opening, mean plaque index, mean decayed teeth, mean DMFT score, and mean dental fluorosis. Whereas the mean gingival index, mean missing teeth and mean filled teeth were statistically insignificant.

Conclusion: The current study concludes that children and early adolescents suffer from oral diseases such as dental caries, plaque, and limited mouth opening. There is a need to conduct oral health intervention studies among schools and local communities to spread oral health awareness and disease prevention. As well as to introduce preventive measures among high-risk subjects.

Keywords: Oral health parameter, dental caries, dental plaque, DMFT index, gingival index, dental fluorosis.

Citation: Zaidi AB, Mohiuddin S, Fatima N, Ahmed T, Qamar A, Haque A. Burden Of Oral Diseases Among Children And Early Adolescents Belonging To Upper And Lower-Middle-Class Schools [Online]. Annals ASH & KMDC 28;3

(ASH & KMDC 28(3):136;2023)

Introduction

Their general health status greatly influences a person's quality of life, and oral health contributes to it. Good oral health leads to a disease and pain-free oral cavity that does not hinder everyday tasks. Diseases of the oral cavity and many other non-communicable diseases also share similar risk factors. It is estimated that oral diseases affect

^{1,2} Department of Community Dentistry, Ziauddin University

³ Department of Dental Material, Ziauddin University

^{4,5,6} Department of Oral Pathology, Liaquat College of Medicine & Dentistry, Darul Sehat Hospital

Correspondence: Dr. Sidra Mohiuddin
Department of Community Dentistry,
Ziauddin University
Email: sidra.mohiuddin@zu.edu.pk
Date of Submission: 17th February 2022
Date of Acceptance: 15th August 2023

nearly 3.5 billion people. According to the Global Burden of Disease 2017, untreated dental caries decay in permanent teeth is the most common health condition¹.

More than 530 million children suffer from primary teeth caries, and severe periodontal disease that ultimately results in tooth loss is common and affects around 10% of the population around the globe. In addition, oral cancer is one of the three most common cancers affecting the population belonging to South Asia and the Pacific regions².

Sixty to ninety percent of school going children and adults belonging to developed nations are affected by caries. In developing countries, resour-

ces have been allocated primarily towards emergency oral care and pain relief. However, if treatment were available, the cost of dental caries in children alone would exceed the healthcare budget³. Limited availability and accessibility of health services among developing countries increase the disease burden within its population. As a result, the disease is causing poor quality of life by affecting school attendance, eating practices, growth, and the development of children and the psychological impact on patients' daily tasks, thus affecting millions of school and work hours to be missed worldwide⁴.

Among oral health problems, dental caries is reported to be the most prevalent childhood disease, which is reported to be five times more common than asthma and seven times more common than hay fever in Pakistan. The prevalence of dental caries is low, i.e., more than 50% of children between 12-15 years of age are caries-free, but at the same time, the disease's severity keeps increasing with age. The World Health Organization's Path Finder Survey conducted in the year 2003 shows that the DMFT score of 12 year-olds is 1.59, rising to 2.26 in 15 year-olds, 8.73 in 35-45 years old age group and 18.39 in 65 years and above age. An alarming finding has been that above 90% of all teeth affected by caries are untreated⁵. According to the WHO goals for developed and developing countries about dental caries, among developed countries, 80% of six years old children should be caries-free, and the mean DMFT score of children belonging to twelve years of age should be 1.5. Whereas for developing countries, 50% of six year-olds should be caries-free, and the mean DMFT score of twelve-year-olds should be 3. Moreover, the prevalence of dental caries in various cities of Pakistan was reported in different years. It showed continuous increase in the levels of dental caries alongwith increasing age of children, i.e., from 3 years to 12 years of age^{6,7,8}. Data from developing countries showed that the oral hygiene of primary school children was poor, as well as increased prevalence of plaque and gingivitis, representing negligence of adequate self-oral hygi-

ene practices among them⁹. On the other hand, a study from Pakistan also reported overall fair levels of oral hygiene among school children with no significant difference between public and private schools¹⁰.

Similarly, a study reported a high prevalence of dental fluorosis (63.6%) among children with a majority of moderate and mild degrees and a community fluorosis index of 1.6. Most children and parents reported having low-to-moderate levels of fluorosis knowledge, and many were concerned about dental fluorosis. Dental fluorosis status was significantly associated with dental caries status in children¹¹. Another parameter observed in the current study was mouth opening as, according to the literature, the limited opening will limit access into the oral cavity, thus preventing a good intraoral assessment, and in dentistry particularly, making the treatment procedure of dental diseases more difficult¹².

Data are scarce on assessing the burden of oral health parameters such as dental caries, plaque, fluorosis, gingivitis, periodontitis, mouth opening, oral cancers, etc., among children and early adolescents of a wide age range. Unfortunately, the last situation analysis conducted in 2004 reported a rising trend of dental caries and periodontal problems with an increase in age-related to the unavailability and inaccessibility of restorative services⁵. Therefore, we conducted the current study to assess the burden of oral problems among children and early adolescents studying in upper-middle and lower-middle-class private schools in Karachi.

Subjects and Methods

A cross-sectional study was conducted among upper-middle and lower-middle-class schools in Karachi. A total of n = 550 study subjects were selected through a nonprobability convenience sampling technique. The inclusion criteria were male and female students from class 6 to class 10, students present on the day of the examination, and students given verbal consent for the study. The exclusion criteria include students with dental anomalies such as amelogenesis imperfecta, dentinogenesis

imperfecta, supernumerary teeth, congenitally absent teeth or teeth missing due to fracture or trauma. The study setting was the schools adjacent to the Ziauddin University Clifton campus. The school’s administration received a letter of permission to conduct the study during the study’s planning phase. The sample size was calculated using a confidence interval of 95%, the power of test at 80%, and the significance level at 0.05 was calculated to be 369, rounded off to 550 depending upon the strength of the schools visited¹³. The ERC reference number is 7030523SMCPD, taken from the ethical review committee of Ziauddin University.

An experienced dentist performed the dental examination. A disposable set of dental examination instruments was used for each study subject. The WHO oral screening form assessed dental caries, plaque, gingivitis, fluorosis, and mouth opening. The dental examination was carried out in an open space under direct sunlight by placing the study subject on a chair in a straight position.

Data were analysed through SPSS software (version 20), and percentages and frequencies for qualitative variables and mean and standard deviation for quantitative variables were carried out. Kolmogorov-Smirnov test was used to assess data normality. In inferential statistics, the Mann-Whitney U test was used to compare oral disease status between upper-middle and lower-middle-class students.

Results

The descriptive of the total study subjects is as the mean age of the study sample is 12.96 ± 2.30., the mean DMFT score is 1.07 ± 2.04, the mean plaque score is 0.38 ± 0.90, and the gingival index is 0.21 ± 0.79, and the mean mouth opening is 36.16 ± 8.65.

The gender-wise distribution of oral health parameters is shown in Table 1, presenting the statistically significant difference in mean mouth opening among males and female study subjects p<0.0001, whereas mean decayed tooth and mean DMFT scores were found to be statistically insignificant p <0.44 and p <0.36 respectively.

The comparison of oral health parameters of study subjects among upper-middle and lower-middle class is presented in Table 2. A statistically significant difference was found among mean mouth opening, plaque index, decayed teeth, DMFT score, and dental fluorosis. The mean gingival index, mean missing teeth and mean filled teeth were statistically insignificant.

Table 1. shows the gender-wise distribution of oral health parameters

Oral health parameters	Male	Female	p-value
Mean Mouth Opening	38.24 ± 8.34	33.18 ± 8.22	0.00
The mean number of Decayed Teeth (D)	0.92 ± 1.93	1.00 ± 1.95	0.44
Mean DMFT score	1.03 ± 2.06	1.12 ± 2.00	0.36

p-value <0.05 is considered significant Mann Whitney U test was applied

Table 2. shows a comparison of oral health parameters.

Study variable	Lower middle Socio-economic Status Mean ± SD	Upper middle Socio-economic Status Mean ± SD	p-value
Mouth Opening	38.33 ± 8.69	34.97 ± 8.41	0.000
Plaque Index	0.65 ± 1.29	0.234 ± 0.534	0.000
Gingival Index	0.37 ± 1.22	0.12 ± 0.35	0.60
Decayed Teeth (D)	1.77 ± 2.73	0.511 ± 1.10	0.000
Missing Teeth (M)	0.092 ± 0.34	0.050 ± 0.26	0.59
Filled Teeth (F)	0.067 ± 0.585	0.03 ± 0.30	0.859
DMFT score	1.93 ± 2.84	0.60 ± 1.18	0.000

p-value <0.05 is considered significant Mann Whitney U test was applied

Discussion

The current study found that mean mouth opening was statistically significant among males and females. In addition, age, mean mouth opening, mean plaque index, mean decayed teeth and mean DMFT scores were significant between upper and lower-middle-class study subjects.

In the current study, the mean DMFT index was statistically significant. This finding is in accordance with the study reported by Bashirian S in 2018¹⁴. Similar results were reported by Ahmed et al. that upper-middleclass subjects often have a high concern for their appearance, which may help to explain their improved DMFT index. They would be more inclined to visit the dentist and learn about dental health. Regular dental visits help patients learn about oral health issues, encouraging them to practice excellent oral hygiene and avoid

oral diseases¹⁵. However, it disagrees with the findings reported by Schwendicke F in 2015¹⁶. The reason may be the lack of school-based preventive programs, scarcity of pediatric dentists, and government funding for such initiatives at the national and provincial levels.

In the current study, the decayed component was more than one-quarter among the study subjects. The outcomes of this analysis were identical to the previous results published by M.Amin in 2016 and Mulu W in 2014^{17,18}. However, the study's sample size reported by Mulu W is lesser than the current study. This finding also relates to the lack of dental care facilities, especially for individuals in low-middle-class groups. Negligence and complete absence of care were also evident in this group.

On the contrary, data from developing countries reported a high proportion of decayed teeth in both groups. Our findings disagree with the study reported by M. Taqi in 2019, Alhabdan YA et al. in 2018, and Bashirian S in 2018^{14,19,20}. The reason may be due to the frequent eating and drinking consumption of fermentable carbohydrates at home and schools, lack of parental supervision toothbrushing, and oral health awareness.

Gingival and plaque indices were chosen for this study as they have been widely used to evaluate the level of gingival inflammation and oral cleanliness in epidemiological studies²¹. The current study reported good mean plaque and fair gingival indexes. These findings are dissimilar to the study reported by Bashirian. S, Rodan R, and Alghamdi AS^{14,22,23}. The reason is that in the current study, the sample was selected from private schools belonging to different socio-economic backgrounds, whereas in the study reported by Rodan R, he recruited a sample from public schools only whereas, Bashirian. S and Alghamdi AS stated poor oral hygiene practices of the study sample. These current study results were interpreted that school children of both groups had fair oral hygiene with mild gingivitis. The difference was statistically non-significant between both groups.

Regarding gender variations, the current study reported nonsignificant results. Contrary, a previous study that described trends in oral health in Jordanian male and female schoolchildren, showed that boys had higher plaque and gingival scores than girls within this age group. This gender difference concerning plaque and gingival scores may be related to the patterns of personal oral hygiene, hormonal changes occurring during puberty, and grooming effects at this age²⁴. Another study found that girls scored more favourably on behavioural measures, showed more interest in oral health, and perceived their oral health to be good to a higher degree than boys²⁵. These gender differences were not obvious among school children surveyed in this study.

The mean mouth opening of the current study is lesser than reported by Chaudhry FA in 2019 and Joshi U in 2021^{26,27}. The possible reason for lesser mouth opening in our study is early exposure to betel nut and smokeless tobacco products used in a subset of Karachi population.

One of the limitations of the current study is the use of small and nonprobability convenience sampling with the study's cross-sectional design, which might affect the generalizability of the study.

It is recommended to have a larger sample size from different provinces of Pakistan. There is a need to conduct oral health intervention studies among schools and local communities to spread oral health awareness and disease prevention. As well as to introduce preventive measures among high-risk subjects.

Conclusion

The conclusion drawn from the current study is as follows; children and early adolescents suffer from oral diseases such as dental caries, dental plaque, and limited mouth opening.

Conflict of Interest

Authors have no conflict of interest and no grant funding from any organization.

References

1. James SL, Abate D, Abate KH, Abay SM, Abbafati C, Abbasi N, et al. Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *The Lancet* 2018;10:392(10159):1789-858. [DOI: 10.1016/S0140-6736(18)32279-7]. Available from: [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(18\)32279-7/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(18)32279-7/fulltext). Accessed on 17th July 2023.
2. Ferlay J, Ervik M, Lam F, Colombet M, Mery L, Piñeros M, Znaor A, Soerjomataram I, Bray F (2020). *Global Cancer Observatory: Cancer Today* [ONLINE] Lyon, France: International Agency for Research on Cancer. Available from: <https://gco.iarc.fr/today>. Accessed on 17th July 2023
3. Peres MA, Macpherson LM, Weyant RJ, Daly B, Venturelli R, Mathur MR, et al. Oral diseases: a global public health challenge. *The Lancet*. 2019 20;394(10194):249-60. [DOI:10.1016/S0140-6736(19)31146-8]. Available from: [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(19\)31146-8/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(19)31146-8/fulltext). Accessed on 26th July 2023.
4. Teshome A, Muche A, Girma B. Prevalence of dental caries and associated factors in East Africa, 2000–2020: systematic review and meta-analysis. *Frontiers in Public Health*. 2021 29;9:645091. [DOI: 10.3389/fpubh.2021.645091.]. Available from: <https://pubmed.ncbi.nlm.nih.gov/33996722/>. Accessed on 26th July 2023.
5. Qureshi A, Safdar NF, Qureshi H, AlFawaz YF, Al Ahdal K, Shabib S, et al. Dietary Factors Influencing the Caries Status of Adults in Karachi, Pakistan: Initial Findings. *International Journal of Environmental Research and Public Health*. 2022 7;19(12):6980. [DOI: 10.3390/ijerph19126980.]. Available from: <https://pubmed.ncbi.nlm.nih.gov/35742227/>. Accessed on 26th July 2023.
6. Mohiuddin S, Nisar N, Dawani N. Dental Caries status among 6- and 12-Years Old School Children of Karachi City. [ONLINE] *J Pak Dent Assoc*. 2015; 24(1):39-45. Available from: <http://www.jpda.com.pk/dental-caries-status-among-6-and-12-years-old-school-children-of-karachi-city/>. Accessed on 26th July 2023
7. Jawed R, Khan Z, Kibria Z, Ahmad F. Dental Caries And Its Determinants Among Children With Special Health Care Needs In District Karachi, Pakistan. [ONLINE] *Khyber Med Univ J* .2020;12(1):19-24. [DOI: 10.35845/kmuj.2020.19726]. Available from: <https://www.kmuj.kmu.edu.pk/article/view/19726>. Accessed on 17th July 2023.
8. Taqi M, Razak IA, Ab-Murat N. Comparing dental caries status using Modified International Caries Detection and Assessment System (ICDAS) and World Health Organization (WHO) indices among school children of Bhakkar, Pakistan [ONLINE]. *Pakistan. J Pak Med Assoc*. 2019 Jul 1;69(7):950-4. Available from: <https://pubmed.ncbi.nlm.nih.gov/31308560/>. Accessed on 26th July 2023.
9. Mohiuddin S, Saadat S, Nisar N. Oral hygiene status of private and public school children from nine towns of Karachi city [ONLINE]. *Pakistan Oral & Dental Journal*. 2015;35(4):661-5. Available from: http://podj.com.pk/archive/Dec_2015/PODJ-25.pdf. Accessed on 26th July 2023.
10. Shakoor A, Khan AS, Ashar T, Mehmood B. Oral hygiene of students in private schools of cantonment region lahore; awareness & current status. *Journal of Khyber College of Dentistry*. 2020 30;10(03):31-4. [DOI: 10.33279/jkcd.v10i03.206]. Available from: <https://journalofkcd.com/index.php/pmsrj/article/view/206>. Accessed on 26th July 2023.
11. Ling Y, Podgorski J, Sadiq M, Rasheed H, Eqani SA, Berg M. Monitoring and prediction of high fluoride concentrations in groundwater in Pakistan. *Science of the Total Environment*. 202215;839:156058. [DOI: /10.1016/j.scitotenv. 2022.156 058]. Available from: <https://www.sciencedirect.com/science/article/pii/S0048969722031552>. Accessed on 26th July 2023.
12. Li XY, Jia C, Zhang ZC. The normal range of maximum mouth opening and its correlation with height or weight in the young adult Chinese population. *Journal of dental sciences*. 2017 Mar 1;12(1):56-9. [DOI:10.1016/j.jds.2016.09.002]. Available from: <https://www.sciencedirect.com/science/article/pii/S1991790216300873?via%3Dihub>. Accessed on 26th July 2023.
13. Siddiqui AA, Alshammery F, Mulla M, Al-Zubaidi SM, Afroze E, Amin J, Amin S, Shaikh S, Madfa AA, Alam MK. Prevalence of dental caries in Pakistan: a systematic review and meta-analysis. *BMC oral health*. 2022;21:1-2. [DOI: 10.1186/s12903-021-01802-x]. Available from: <https://bmcoralhealth.biomedcentral.com/articles/10.1186/s12903-021-01802-x#citeas>. Accessed on 17th July 2023.
14. Bashirian S, Shirahmadi S, Seyedzadeh-Sabounchi S, Soltanian AR, Karimi-Shahanjarini A, Vahdatinia F. Association of caries experience and dental plaque with sociodemographic characteristics in elementary school-aged children: a cross-sectional study. *BMC oral health*. 2018;18:1-2. [DOI: 10.1186/s12903-017-0464-4]. Available from: <https://bmcoralhealth.biomedcentral.com/articles/10.1186/s12903-017-0464-4>. Accessed on 26th July 2023.
15. Ahmed MA, Jouhar R, Faheemuddin M, AlJafar A, Alabawi H, Alhumaidi B, et al. Assessment of Oral Health Knowledge, Attitude, Practice and DMFT Scores among Patients at King Faisal University, Al-Ahsa. *Medicina*. 2023;59(4):688. [DOI: 10.3390/

- medicina59040688]. Available from: <https://www.mdpi.com/1648-9144/59/4/688>. Accessed on 26th July 2023
16. Schwendicke F, Doost F, Hopfenmüller W, Meyer Lueckel H, Paris S. Dental caries, fluorosis, and oral health behavior of children from Herat, Afghanistan. *Community dentistry and oral epidemiology*. 2015;43(6):521-31. [DOI:10.1111/cdoe.12177]. Available from: <https://onlinelibrary.wiley.com/doi/10.1111/cdoe.12177>. Accessed on 26th July 2023.
 17. Amin M, Amanullah M, Tarar AM. Dental Caries, Periodontal Disease and their associated factors among patients visiting dental teaching hospital in Multan. Pakistan. [ONLINE] *Journal of the Pakistan Dental Association*. 2016;25(03):99. Available from: <https://www.jpda.com.pk/dental-caries-periodontal-disease-and-their-associated-factors-among-patients-visiting-dental-teaching-hospital-in-multan-pakistan-2/>. Accessed on 17th July 2023.
 18. Mulu W, Demilie T, Yimer M, Meshesha K, Abera B. Dental caries and associated factors among primary school children in Bahir Dar city: a cross-sectional study. *BMC research notes*. 2014;7(1):1-7. [DOI: 10.1186/1756-0500-7-949]. Available from: <https://bmcrsnotes.biomedcentral.com/articles/10.1186/1756-0500-7-949#citeas>. Accessed on 17th July 2023.
 19. Taqi M, Razak IA, Ab-Murat N. Comparing dental caries status using Modified International Caries Detection and Assessment System (ICDAS) and World Health Organization (WHO) indices among school children of Bhakkar, Pakistan. *Pakistan. J Pak Med Assoc*. 2019;69(7):950-4 Available from: <https://pubmed.ncbi.nlm.nih.gov/31308560/>. Accessed on 17th July 2023.
 20. Alhabdan YA, Albeshr AG, Yenugadhathi N, Jradi H. Prevalence of dental caries and associated factors among primary school children: a population-based cross-sectional study in Riyadh, Saudi Arabia. *Environmental health and preventive medicine*. 2018;23(1):1-4. [DOI: 10.1186/s12199-018-0750-z]. Available from: <https://pubmed.ncbi.nlm.nih.gov/30497366/>. Accessed on 17th July 2023.
 21. Al-Haddad KA, Ibrahim YT, Al-Haddad AM, Al-Hebshi NN. Assessment of gingival health status among 5- and 12-year-old children in Yemen: a cross-sectional study. *ISRN [ONLINE]. Dent*. 2013;26:1-7. [DOI:10.1155/2013/352621]. Available from: <https://www.hindawi.com/journals/isrn/2013/352621/>. Accessed on 17th July 2023.
 22. Rodan R, Khlaifat F, Smadi L, Azab R, Abdalmohdi A. Prevalence and severity of gingivitis in school students aged 6–11 years in Tafelah Governorate, South Jordan: results of the survey executed by National Woman's Health Care Center. *BMC research notes*. 2015;8(1):1-7. [DOI: 10.1186/s13104-015-1532-y]. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4640206/>. Accessed on 17th July 2023.
 23. AlGhamdi AS, Almarghani AA, Alyafi RA, Kayal RA, Al-Zahrani MS. Gingival health and oral hygiene practices among high school children in Saudi Arabia. *Annals of Saudi Medicine*. 2020 Mar;40(2):126-35. [DOI:10.5144/0256-4947.2020.126]. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7118235/>. Accessed on 17th July 2023.
 24. Quteish Taani D. Trends in oral hygiene, gingival status and dental caries experience in 13–14-year-old Jordanian school children between 1993 and 1999. *Int Dent J*. 2001;51:277–81. [DOI: 10.1002/j.1875-595x.2001.tb00858.x.]. Available from: <https://pubmed.ncbi.nlm.nih.gov/11789712/>. Accessed on 17th July 2023.
 25. Zaborskyte A, Bendoraitiene E. Oral hygiene habits and complaints of gum bleeding among schoolchildren in Lithuania. [ONLINE] *Stomatologija*. 2003;5:31–6. Available from: <https://sdbdmj.com/031/031-07.pdf>. Accessed on 17th July 2023.
 26. Chaudhary FA, Ahmad B, Butt DQ, Hameed S, Bashir U. Normal range of maximum mouth opening in pakistani population: a cross-sectional study. *Journal of International Oral Health*. 2019;11(6):353-6. [DOI: 10.4103/jioh.jioh_127_19]. Available from: <https://www.jioh.org/article.asp?issn=0976-7428;year=2019;volume=11;issue=6;spage=353;epage=356;aulast=Chaudhary>. Accessed on 17th July 2023.
 27. Joshi U, Poudyal S, Hekka S, Lawaju N, Pradhan M. Maximum mouth opening of children in Newari population of Bhaktapur. *Journal of Chitwan Medical College*. 2021;11(2):88-91. 30. [DOI: 10.54530/jcmc.446]. Available from: <https://www.jcmc.com.np/jcmc/index.php/jcmc/article/view/446>. Accessed on 17th July 2023.



This open-access article distributed under the terms of the Creative Commons Attribution NonCommercial 4.0 License (CC BY-NC 4.0). To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc/4.0/>