Demographic factors associated with oral health behaviour in children aged 5–17 years in Algeria

Sidi-Yakhlef Adel[1], Boukhelif Meryem[2], Moussouni Abdellatif[3]

[1]Social Science Department, Laboratory of Populations and Sustainable Development in Algeria, Faculty of Human and Social Sciences, University of Tlemcen, Algeria; [2]Department of Psychology, Faculty of Human and Social Sciences, University of Tlemcen, Algeria; [3]CNRPAH Tlemcen's Station, National Centre for Prehistoric, Anthropological and Historical Research, Algeria

Objectives: Oral health plays an important role in determining quality of life, general health, and well-being in both children and adults. The wide variation in oral health status around the world is determined by multiple factors, including oral health behaviour (OHB). The aim of this study was to explore the association of some demographic factors with OHB in children aged 5 to 17 in Algeria. ***Methods***: Secondary analysis of cross-sectional data involving all children aged 5 to 17 in the Multiple Indicator Cluster Survey database, conducted in 2018-2019 (MICS-6), i.e., 17019 children (8882 boys and 8137 girls). Using a logistic regression model, we assessed the contribution of different demographic, economic, and geographical factors to children's OHB. ***Results***: The overall prevalence of good oral hygiene practices was 9.32% (8.30% for boys and 10.36% for girls). The main factors associated with good OHB were gender (OR=1.27 [95% CI = 1.135-1.437]), residence (OR=0.641 [0.553-0.742]), geographical area particularly in the southern and highlands regions (OR=0.369; [0.28-0.48]), older age, mother's level of education (OR=2.61 [2.12-3.21]), employment status, and economic level (OR=3.30 [2.64-4.12]). ***Conclusions***: The identification of factors related to OHB in children is of great interest in developing countries such as Algeria, to adopt planned and targeted health promoting interventions for children, adolescents, and parents.

Keywords: *Algeria, Children, Oral health, Associated factors, MICS6*

Introduction

Oral health plays an important role in determining quality of life, general health, and well-being in both children and adults. It enables them to perform essential functions and influences their self-confidence, their ability to form social bonds, and their ability to work without pain and discomfort (World Health Organization (WHO), 2022).

Although most oral diseases such as dental caries and gingival conditions are preventable, they are the most widespread in the world in general and in Africa in particular. In 2019, oral diseases affected around 43.7% of the population in the African Region of the World Health Organization (WHO, 2022).

The wide variation in oral health status around the world is determined by multiple factors, including demographic structure, levels of oral health behaviour (OHB), dental programs, oral and accessibility to dental health professionals (Fiorillo, 2019).

Good OHB in children not only helps to prevent dental diseases such as cavities but also promotes the healthy development of teeth and gums (WHO, 2022). This crucial stage in children's growth requires an educational and preventive approach involving parents, educators, and dental health professionals. By understanding the importance of a balanced diet, optimal brushing practices and the appropriate choice of dental products, parents can play an essential role in preserving their children's oral health (Thilakarathne, 2023; Al Subait *et al*., 2016). Tooth brushing should start as soon as the first tooth erupts, generally from the age of six months. Brushing twice a day with fluoride toothpaste reduces the risk of tooth decay by 14% (American Dental Association Council, 2014). Fluoride plays a fundamental role in the prevention of dental caries and is also used therapeutically to inactivate incipient caries lesions. The effect of fluoride is mainly achieved by topical application, which is further enhanced when accompanied by good oral hygiene, particularly in children (Toumba *et al*., 2019).

However, oral health behaviours appear to mediate the effect of broad demographic factors in the aetiology of oral disease. Consequently, studying the demographic determinants of OHB in children is of crucial importance in understanding the disparities that may exist in oral health within the child population. By examining these determinants, we aim to identify the factors influencing dental care behaviour to devise and target interventions.

In Algeria, a study carried out by the National Institute of Public Health (INSP) in 2013 on the oral health status of Algerian children revealed that 36.3% of children under 15 had poor oral hygiene (INSP, 2014). Few recent studies have analysed the determining factors in the practice of oral hygiene in Algeria. Most of these studies, which have focused on schoolchildren or adolescents, have been conducted at regional level (Tahari, 2023). Given that the MICS survey reports are limited to descriptive analyses, this study aimed to explore the association between some demographic, economic, and geographical factors (gender, mother's level of education, geographical area of residence, wealth index, etc.) with OHB of children aged 5 to 17 in Algeria. Knowing and mastering these factors will help us to understand the disparities that may exist in oral health within the child population and will also help better target oral health promotion strategies.

Correspondence to: Prof. SIDI-YAKHLEF ADEL. Email: bioadel2005@yahoo.fr

Methods

This cross-sectional study analysed data from the Multiple Indicator Cluster Survey conducted in 2018-2019 (mics6) by the Algerian Ministry of Health, Population and Hospital Reform, with technical and financial support from UNICEF and a financial contribution from UNFPA. This database and detailed country specific data are available on the UNICEF (2019) website. These descriptive surveys enable many countries to produce statistically reliable estimates for a series of indicators in various fields, particularly health, to monitor the health of children and women, thereby helping decision-makers to draw up policies and intervention programmes.

The data used to study children's OHB came from the module on children aged 5-17 years, randomly selected and living in the household. Collected data included a questionnaire administered to the child's mother or main carer. Our study covered all children aged between 5 and 17, i.e. 17019 children in the database (8882 boys and 8137 girls). Verbal consent was obtained for each person interviewed; for children aged 15 to 17 interviewed individually. Adult consent was obtained before the child's assent. All respondents were informed of the voluntary nature of their participation and of the confidentiality and anonymity of the information collected about them. In addition, respondents were informed of their right to refuse to answer all or specific questions, as well as their right to stop the interview at any time (Ministry of Health and Population of Algeria, 2021).

The variable of interest, OHB, was derived in accordance with the existing literature (Peterson *et al.*, 2005; Al Subait *et al.*, 2016; WHO, 2022) as a binary variable. OHB was considered good if the children cleaned their teeth by brushing with toothpaste at least once a day, and if they visited the dentist at least once a year.

To get a better understanding of the factors associated with OHB, we included demographic variables in the database, such as the child's sex and age, the mother's level of education and occupational status, the socio-economic level expressed as a wealth quintile, the residence (rural or urban) and the geographical area expressed by the Territorial Programming Area.

A description was given of each variable that led to the design of the dependent variable (OHB), namely the frequency of tooth brushing, the material used for brushing and the frequency of visits to the dentist. The associations between children's OHB status and potential predictor variables were tested in logistic regression. From the bivariate logistic regression test model, only variables associated with the dependent variable at $p < 0.05$ were entered into the final multivariate regression model where associations were expressed as an odds ratios (OR) and 95% confidence intervals. Multicollinearity between variables was assessed using the multicollinearity diagram (variance inflation factor and tolerance test). The final multivariate binary logistic regression model was found to be consistent with the results of the Hosmer-Lemeshow goodness-of-fit test. All analyses were conducted using SPSS version 25 software.

Results

The study involved 17019 children, including 8882 boys (52.8%) and 8137 girls (47.8%) in three age groups: 5 - 9 years (44.4%), 10 - 14 years (34.8%) and 15 - 17 years (20.8%).

Table 1 shows the proportions of tooth brushing frequency, the use of fluoridated toothpaste and proportions visiting the dentist among children by gender. Forty per cent of children brushed their teeth daily while 37.4% occasionally and 22.6% never brushed. Girls were more likely to brush their teeth daily or more and to have visited a dentist. Nearly all (96.6%) of children who brushed their teeth reported that they did so with toothpaste, compared with 3.4% who brushed with water only. Only 12.3% of children visited the dentist for an annual check-up, while 36.6% went only in case of pain. Most children (51.1%) never went to the dentist. Only 9.32% (8.30% boys and 10.36% girls) met the criterion of good oral health behaviour.

The results of multivariate logistic regression analysis show that, the female sex, urban area, living in the North and West Highlands regions, children's older age, mothers' high level of education, mothers that work and high parents' socio-economic level were associated with good OHB (Table 2).

Table 1. Oral Health Behaviour by Gender in 17019 Algerian Children.

	Male (n=8882) %	Female (n=8137) %	Total (n=17019) %
Brusing frequency			
At least once/day	35.2	45.2*	40
Occasionally	39.2	35.4	37.4
Never	25.6	19.4	22.6
Use of fluoridated toothpaste			
Toothpaste	96.6	96.8	96.6
Water	3.4	3.2	3.4
Dental Consultation			
At least once/years	11.4	15.2*	12.3
in case of pain	35.3	38.1	36.6
Never	53.3	46.7	51.1

* $p < 0.05$, Chi sq.

Discussion

This study, carried out with a representative sample of 17020 children aged between 5 and 17 years from the 2018-2019 Multiple Indicator Cluster Survey (MICS 6) database, describes the profile and identifies the demographic factors affecting OHB in these children.

Over 60% of children have a poor brushing habit. This prevalence is higher than in Iran (20.1%), Benin (50%) and Scotland (18%) (Rezaei and Yara, 2020; Djossou *et al.*, 2016; Levin and Currie, 2009). However, it is still lower than Indonesia (89.2%), Saudi Arabia (66.5%) and even most middle-income or low-income countries

Table 2. Associations With OHB Status Determined by Multivariable Logistic Regression.

Variables	Bad OHB N=11967 Proportion	Good OHB N=1231 Proportion	Odds ratio	95% CI
Gender of child				
Male	0.51	0.45	1	
Female	0.49	0.55	1.277	1.135-1.437
Living area				
Urban	0.73	0.81	1	
Rural	0.27	0.19	0.641	0.553-0.742
Territorial Planning region				
North-Central	0.15	0.19	1	
North-East	0.13	0.18	0.734	0.793-1.177
North-West	0.14	0.16	1.171	0.983-1.345
Central Highlands	0.15	0.08	0.369	0.28-0.487
East Highlands	0.14	0.11	0.503	0.491-0.792
West Highlands	0.14	0.15	1.018	0.794-1.215
South	0.14	0.11	0.677	0.529-0.877
Age				
5-9	0.42	0.35	1	
10-14	0.35	0.38	1.293	1.127-1.482
15-17	0.22	0.27	1.448	1.245-1.684
Mother's education level				
Preschool or None	0.23	0.15	1	
Primary	0.18	0.12	0.954	0.763-1.193
Middle	0.27	0.25	1.371	1.137-1.653
Secondary	0.23	0.30	1.916	1.598-2.298
Higher	0.09	0.17	2.613	2.122-3.216
Mother's occupation				
Occupied	0.10	0.15	1	
Unoccupied	0.9	0.85	0.633	0.536-0.749
Wealth index quintiles				
The poorest	0.16	0.08	1	
Second	0.19	0.14	1.423	1.108-1.829
The middle	0.22	0.18	1.589	1.249-2.022
The Fourth	0.29	0.23	2.096	1.661-2.643
The richest	0.20	0.35	3.302	2.642-4.126

CI: Confidence Interval

(70%) (Al Subait *et al*., 2016; Han, *et al*., 2020; Santoso *et al*., 2021). This may be mainly due to children's lack of acceptance of toothbrushing, which may be a direct result of parental awareness and attitudes (Al Subait *et al*., 2016; Toumba *et al*., 2019). However, 96.6% of children who brushed used toothpaste, which may be due to its cultural acceptability and availability in all shops at a very accessible price.

An annual visit to the dentist is recommended by all health professionals to give the dentist the opportunity to advise parents on the prevention of oral diseases and enables early detection of dental caries and halt its progression (Smith *et al*., 2020). Only 12.3% of Algerian children went for an annual dental check-up. This may be due to the high cost of dental care in Algeria and the low availability of care, especially in rural areas. A combination of constraints and difficulties the population to forego care in eastern Algeria in particular the financial constraints of the household, and the dilapidated state of the equipment in public health facilities. Patients are often obliged to go to the private sector, which is relatively under-reimbursed. Geographical remoteness is also a factor, as is the uneven distribution of healthcare provision (Cheurfa, 2020). Some parents may also regard the primary teeth are temporary and therefore do not attach importance to the care and treatment of deciduous teeth (Mishra *et al*., 2018).

Since 2001, the Prevention Department of the Ministry of Health has been implementing a National School Oral Health Programme. This programme is based on a network of screening and monitoring units, located throughout the country, to take care of the health problems of schoolchildren. To date, the school population is covered by 1781 units and 2033 school health dental surgeons. In the private sector in 2014 there was one dentist for just under 3500 inhabitants, i.e. 12872 dentists (INSP, 2013). Algeria has a universal health insurance system, with a large proportion of healthcare costs covered by

the state. However, this coverage is very low for dental care, even insignificant. Which explains the reluctance of many people to consult a dentist or even to forego dental treatment altogether.

Overall, 9.32% of children had good OHB. This prevalence is much lower than the 19.2% found in 2013 by the National Institute of Public Health (INSP, 2013) in Algeria, which was and lower than that found in Oran in western Algeria (28%) and in Spain and Iran (Tahari, 2023).

The results of the logistic regression analysis showed that sex, area of residence, geographical region, age, mother's level of education, status and economic level are factors associated with good OHB. The same results were found in a study in Iran (Rezaei and Yara, 2020) and in several other studies (Mishra *et al.*, 2018; Deng *et al.*, 2019).

Our results showed a difference in OHB between the two sexes, in favour of girls (55%) compared with boys (45%). The same result was found in the INSP study (INSP, 2013). Such differences have been the subject of several studies (Mishra *et al.*, 2018; Cui *et al.*, 2023). One possible reason for the difference, and particularly for children over the age of ten, is that girls pay more attention to their appearance than boys, and being concerned about the condition of their teeth is related to the desire to look nice (Cui *et al.*, 2023) .

Studies in several countries have reported that oral health behaviours improve with age (Smith *et al.*, 2020; Cui *et al.*, 2023). This may be because as they grow older, adolescents may have more opportunities to learn about oral health. At the same time, they may attach more importance to oral hygiene as their self-esteem increases (Pazos *et al.*, 2019).

The direct reasons of the difference in OHB between the northern regions, Highlands and the South are unknown but may be due to the living conditions in this environment, such as the poor water supply, the accessibility of healthcare and the lack of commodities found in the northern regions. Differences in socio-economic status, lifestyle, eating and cultural habits and perceptions of oral health between the regions of Algeria may also account for it.

High socio-economic status favoured good OHB, as is reported in other countries, including Belgium and Iran (Vereecken *et al.*, 2004; Rezaei and Yara, 2020). Several studies have reported a positive relationship between good OHB and the parents' high level of education and the mother's professional status (Rezaei and Yara, 2020; Cui *et al.*, 2023). Higher socio-economic status, which enables them to have a healthy lifestyle with a good knowledge of preventive activities and positive attitudes to nutrition, toothbrushing and regular medical check-ups and greater access to that care, including regular visits to the dentist (Deng *et al.*, 2019).

Children living in urban areas were more likely to have good OHB. In general, these families have higher socio-economic status and greater access to healthcare. Conversely, people living in rural areas often have lower health literacy and use of health care services less (Cui *et al.*, 2023; Kowash, 2017).

To develop relevant health education initiatives, it is necessary to understand the factors that influence and give rise to health behaviours, and the processes involved in learning about health, in the same way that epidemiology and general medicine seek to establish the causal link between agent and disease, between risk and disease, between behaviour, risk and consequence. Every needs analysis method is based on an explanatory model or theory of health behaviour. More than twenty models have been developed or used, the best known being social learning theories, the theory of social representations and integrative models (Arwidson *et al.*, 2001).

It is recommended that a comprehensive approach be adopted to reduce all forms of inequality and achieve lasting improvements in oral health. This means acting on the underlying determinants of oral disease and creating a social environment that facilitates and maintains good oral health in the population as a whole. If we do not focus on improving the social conditions that determine behaviour, inequalities in oral health will persist and may even worsen (Sheiham, 2000). Whether at local, national or even international level, public policy, legislation and tax measures can all be used to promote and improve oral health. A series of complementary public health measures can be implemented, such as, introducing health education as a core subject in schools, encouraging the sale of attractive toothbrushes and subsidised toothpaste in schools, make school visits to the dentist every 6 months and subsidise treatment, encouraging oral health professionals to set up practices in high-risk areas such as rural areas and the southern regions by offering attractive benefits. (Watt, 2007; Sabbah *et al.*, 2009).

Certain limitations need to be considered in this study. First, the data used were self-reported without an oral examination, and are therefore susceptible to social-desirability and recall bias. Secondly, the cross-sectional data prevent attribution of cause and effect. Also, in future surveys, oral examinations should be carried out in addition to self-reported measurements.

Nevertheless, the strength of this study lies in the data coming from a nationally representative random sample that were collected using the well-defined criteria of the World Health Organization, which has long experience of epidemiological survey and surveillance methodology that has been used in several countries (UNICEF, 2019).

Logistic regression is an efficient way to evaluate independent variable contributions to a binary outcome, but its accuracy depends in large part on careful variable selection with satisfaction of basic assumptions, as well as right choice of model building strategy and validation of results. The limitations of the logistic regression models used in the study are that they assume compensatory relationships between predictors and do not address the least-favored factor determining distribution (Stoltzfus, 2011). It is possible that adopting a health behaviour model and analysing it using a structural equation model could yield better results.

Conclusion

The main socio-demographic determinants associated with good OHB among children and adolescents aged 5 to 17 in Algeria according to mics 6 survey data, were gender, residence, geographical area, older age, mother's level of education, employment status, and economic level. This

behaviour can be improved by actions including education sessions for children, adolescents and parents to correct certain errors of attitude and increase their knowledge of oral health. Although the importance of protecting children remains one of the priorities of health and social protection policy in Algeria, there is an urgent need to improve prevention policies, such as extending health education and access to care to as many people as possible, by making dentists an essential link in health education inside and outside their dental practices. These results should help to measure progress towards achieving the goals of the new 2030 Agenda for Sustainable Development, and will be very useful for developing, monitoring and evaluating population policies and health programmes, particularly prevention programmes, and improving people's future ability to perceive and manage their health needs.

Acknowledgements

Conflict Of Interest

The authors declare no conflicts of interest.

References

Al-Subait, A.A., Alousaimi, M., Amritha, G., Anna, A. and El-Metwally, A. (2016) : Oral Health Knowledge, Attitude and Behavior among Students of Age 10–18 Years Old Attending Jenadriyah Festival Riyadh; a Cross-Sectional Study. *The Saudi Journal for Dental Research* **7**, 45–50.

American Dental Association Council on Scientific Affairs (2014) : Fluoride toothpaste use for young children. *Journal of The American Dental Association* **145**, 190-1.

Arwidson, B., Bury, J., Choquet, M. and De peretti, C. (2001) : Éducation pour la santé des jeunes : démarches et méthodes. *Paris: Inserm.* **247**, 25-26.

Cheema, S., Maisonneuve, P., Al-Thani, M.H., Al-Thani, A.A.M., Abraham, A., Al-Mannai, G.A., Al-Emadi, A.A., Al-Chetachi, W.F., Almalki, B.A., Hassan, K., Haj Bakri, A.O., Lowenfels, A. and Mamtani, R. (2017): Oral health behavior and factors associated with poor oral status in Qatar: results from a national health survey. *Journal of Public Health Dentistry* **77**, 308-316

Cheurfa, T. and Kaid, T.N. (2020): The problem of social disparities in health in Algeria: An exploratory study of healthcare renunciation in the department of Bejaia. *Les Cahiers du MECAS* **16**, 153-170

Cui, Z., Wang, W., Wang, X., Feng, X., Tai, B., Hu, D., Lin, H., Wang, B., Wang, C., Zheng, S., Liu, X., Rong, W., Wang, W. and Si, Y. (2023): Oral hygiene behaviours and their associated factors in Chinese adolescents: Evidence from the National Oral Health Surve. *Research Square* https://doi.org/10.21203/rs.3.rs-2254609/v2

Deng, L., Cai, T., Li, Y-H., Zhou, Z. and Yang, Z-Y. (2019): Tooth brushing behavior and its influencing factors among middle school students in Chongqing, China. *International Journal of Clinical and Experimental Medicine* **12**, 8957–8963.

Djossou, D., Houngbegnon, P., Kponon, S. and Javotte, N. (2016): Hygiène orale et carie dentaire: Enquête auprès de 191 étudiants sur le campus d'ABOMEYCALAVI (BÉNIN). *Revue du Collège d'Odonto-Stomatologie Africain et de Chirurgie Maxillo-Faciale* **23**, 47-50.

Fiorillo, L. Oral Health (2019): The First Step to Well-Being. *Medicina* **55**, 676.

Han, L., Gao, X., Liao, M., Yu, X., Zhang, R., Liu, S. and Zeng, F. (2020): Hygiene practices among young adolescents aged 12-15 years in low- and middle-income countries: a population-based study. *Journal of Global Health* **10**, 020436.

Institut National de Santé Publique (INSP) (2013): Etat de Santé Buccodentaire de l'Enfant Algérien 6 ans, 12 ans et 15 ans. *Alger Impression Anep Rouiba*, 11-73

Kowash, M.B., Alkhabuli, J.O., Dafaalla, S.A., Shah, A. and Khamis, A.H. (2017): Early childhood caries and associated risk factors among preschool children in Ras Al-Khaimah, United Arab Emirates. *European Archives of Paediatric Dentistry* **18**, 97–103.

Levin, K. and Currie, C. (2009): Inequalities in toothbrushing among adolescents in Scotland 1998–2006. *Health Education Research* **24**, 87–97.

Ministry of Health and Population (Algeria), United Nations Children's Fund (UNICEF) (2021): *Algeria Multiple Indicator Cluster Survey 2018-2019*. New York, United States of America: United Nations Children's Fund (UNICEF). https://mics.unicef.org/surveys

Mishra, A., Pandey, R.K., Chopra, H. and Arora, V. (2018): Oral health awareness in school-going children and its significance to parent's education level. *Journal of the Indian Society of Pedodontics and Preventive Dentistry* **36**, 120–124.

Pazos, C.T.C., Austregésilo, S.C. and Goes, P.S.A. (2019): Self-esteem and oral health behavior in adolescents. *Ciencia & Saude Coletiva* **24**, 4083–4092.

Rezaei, S. and Yara A, H.R. (2020): Oral Health Behaviors among Schoolchildren in Western Iran: Determinants and Inequality. *Clinical, Cosmetic and Investigational Dentistry* **12**, 319–326.

Sabbah, W., Tsakos, G., Sheiham, A. and Watt, R.G. (2009): The role of health-related behaviors in the socioeconomic disparities in oral health. *Social Science & Medicine* **68**, 298–303.

Santoso, C.M.A., Bramantoro, T., Nguyen, M.C. and Nagy, A. (2021): Lifestyle and psychosocial correlates of oral hygiene practice among Indonesian adolescents. *European Journal of Oral Sciences* **129**, e12755.

Sheiham, A. (2000): Improving oral health for all: focusing on determinants and conditions. *Health Education Journal* **59**, 351–63

Stoltzfus, J.C. (2011): Logistic regression: a brief primer. *Academic Emergency Medicine* **18**, 1099-104.

Tahari, N. (2023): Prévalence de la carie dentaire chez des enfants de 06 à 11 ans scolarisés dans une école primaire dans la région ouest d'Oran. *Algerian Journal of Health Sciences*. **5**, 81-87.

Thilakarathne, B. (2023): Toothbrushing practices as risk factors for dental fluorosis in an area with varying fluoride levels in drinking water. *Community Dental Health* **40**, 92.

Toumba, K.J., Twetman, S., Splieth, C., Parnell, C., van Loveren, C. and Lygidakis, N.A. (2019): Guidelines on the use of fluoride for caries prevention in children: An updated EAPD policy document. *European Archives of Paediatric Dentistry* **20**, 507–516.

UNICEF (2019): *Multiple Indicator Cluster Surveys (MICS)*. Available from: http://mics.unicef.org/surveys.

Vereecken, C.A., Maes, L., De Bacquer, D. (2004): The influence of parental occupation and the pupils' educational level on lifestyle behaviors among adolescents in Belgium. *Journal of Adolescent Health* **34**, 330–338.

Watt, R.G. (2007): From victim blaming to upstream action: Tackling the social determinants of oral health inequalities. *Community Dentistry and Oral Epidemiology* **35**, 1–11.

World Health Organization (WHO) (2022): *Global Oral Health Status Report: Towards Universal Health Coverage for Oral Health by 2030*. Available from: https://www.who.int/publications-detail-redirect/9789240061484