

Dental caries, oral hygiene status and treatment needs of fishermen and non-fishermen population in South Goa, India

Varkey N.S.¹, Rhea Vas¹, Humsika Uppala¹, Nazleen Valerie Vas¹, Sagar Jalihal¹, Anil V. Ankola¹, Ram Surath Kumar K.¹

Department of Public Health Dentistry, KAHER's KLE Vishwanath Katti Institute of Dental Sciences, Karnataka, India

ABSTRACT

Background: Occupation plays a major role in the well-being of an individual and has an influence on oral health. Fishing is one such occupation that entails a lot of physical labour and encourages habits that lead to poor oral health. Therefore, it is critical to shed light on the oral health of this isolated population to improve their quality of life by various means. The aim of the study was to assess and compare the prevalence of dental caries, oral hygiene status and treatment needs of fisherman and non-fisherman population in South Goa, India.

Materials and methods: Study design was cross-sectional in nature. After a pilot study, multi-stage random sampling technique was employed and 400 study participants were recruited. World Health Organization Oral Health Assessment Form (1997) and Oral Hygiene Index-Simplified (OHI-S) were used to record the study variables. Inter-examiner reliability assessed using Kappa statistics were found to be 90% and 88%, respectively. The data was analysed using descriptive analysis, Chi-square test, Mann-Whitney U test, Kruskal-Wallis test, and linear and logistic regression analysis.

Results: Fishermen had significantly higher caries prevalence (82%) and poor oral hygiene (46%) than non-fishermen. Extraction (42.2%) and pulp care (23.6%) were the highest treatment need among fishermen. They were 2.08 times more prone to dental caries than non-fishermen. Fishermen who used a toothbrush were 4.5 times less susceptible to caries. The dependence of caries prevalence and OHI-S score on occupation, oral hygiene aid and age were 14% and 25.8%, respectively.

Conclusions: Fishermen in South Goa had high caries prevalence, poor oral hygiene status and they required extensive dental treatment when compared to non-fishermen.

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Key words: dental caries, fishermen, occupational health, oral health, oral hygiene

INTRODUCTION

Oral health gives a general picture of the overall health and quality of life of a person. Every major disease has certain oral manifestations. Good oral health significantly improves the standard of living [1]. The body's inbuilt defences along with good oral hygiene practices significantly reduce the risk of oral disease [2]. Low socio-economic status and

systemic diseases can also have detrimental impact on oral health-related quality of life, while some research shows that physical activity and a high socioeconomic position are possible protective factors for good oral health [3]. These factors are influenced by the occupation of an individual.

Occupation has a major role on the well-being of an individual. White collar jobs, which have more of a sedentary

✉ Dr. Rhea Vas, Department of Public Health Dentistry, KAHER's KLE Vishwanath Katti Institute of Dental Sciences, Belagavi-590010, Karnataka, India, tel: +918600624042, e-mail: rheavs100@gmail.com

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lifestyle is associated with lower back pain and obesity [4], whereas blue collar jobs are more prone to early onset of non-communicable diseases such as diabetes and hypertension. Some blue-collar jobs are strongly linked with the risk factors of cardiovascular disease and have slightly worse endothelial function [5, 6]. Nutritional deficiencies are also common in some line of work [7]. People who work in some professions are more prone to oral illness due to lifestyle variables; one such line of work is fishing.

Fishing is a blue-collar job that entails a lot of physical labour. It encourages bad behaviours such as irregular eating patterns, stress, alcoholism, tobacco use, and other undesired habits. Unlike other professions in India, there haven't been much technological innovations to improve the fishermen's working conditions. They continue to fish using traditional techniques, which is hazardous in many ways [8]. The prevalence of injuries during work and musculoskeletal disorders are high among this group [9, 10].

India has a total of 7,500 km of coastline and 3,827 fishing villages. It is the world's third-largest producer of fish and ranks second in aquaculture. Fishing is a significant contributor to the nation's economy. The export earnings from this industry is ₹334.41 billion (US\$ 4.5 bn) and it contributes 1.07% to the country's overall gross domestic product (GDP). It is a large-scale industry in India employing 14.5 million personnel [11].

Fishing is one of the primary occupations in Goa, which is a tourist state located on the south-west coast of India with a coastline of 104 km stretching along the Arabian sea. The state has two districts, South Goa being one of them. Marine fishing in Goa contributes 3% of the state GDP and 2% of the total marine fish production of the country [12]. Since the mid-16th century, the local people have been fishermen. They reside in small settlements close to the fish landing centres. They use tobacco products to avoid seasickness and stay observant at night while working at sea and have a tendency of drinking alcohol after a hard day's labour. Fishing provides livelihood to a large number of people in South Goa and plays a vital role in its socioeconomic development.

Despite being one of the major occupations in India, studies on this secluded population remains scanty. Therefore, purpose of the study is to assess and compare the prevalence of dental caries, oral hygiene status and treatment needs of fisherman and non-fisherman population in South Goa, India.

MATERIALS AND METHODS

STUDY SETTING

This study was descriptive, cross-sectional in nature that followed STROBE guidelines for reporting. It was conducted among fishermen and non-fishermen population in South Goa district in India from November 2019 to January 2020.

ETHICAL CONSIDERATIONS AND INFORMED CONSENT

The ethical clearance was granted by the Institutional Research and Ethics Committee (23/12/10/19) and the study followed the ethical standards outlined in the 1964 Declaration of Helsinki and its subsequent modifications. An official permission was obtained from the fisheries officer of Cutbona jetty in South Goa, India. The method of data collection, confidentiality of the data and purpose of the study was explained clearly to the study participants and a written informed consent was obtained.

TRAINING AND CALIBRATION

The examiners were standardised and calibrated to ensure consistent examination by a panel of experts prior to the start of the study to ensure uniform interpretations of the codes and criteria that were to be recorded. The number of examiners were two and the inter-examiner reliability for World Health Organization (WHO) Oral Health Assessment Form (1997) [13] and Oral Hygiene Index Simplified (OHI-S) [14] was assessed using Kappa statistics and found to be 90% and 88%, respectively.

SELECTION CRITERIA

Participants aged 18 years and above were recruited and those who were not willing to participate and give consent for the study were excluded.

SAMPLE SIZE ESTIMATION AND SAMPLING TECHNIQUE

A pilot study was conducted among 50 participants to determine the feasibility of the study. The sample size was estimated to be 188 in each group with type I (α) error = 0.05 and Power ($1-\beta$) = 0.95 using G*Power statistical software (Ver. 3.1.9.4.), which was rounded off to 200 per group. Hence, this study consisted of a total sample size of 400. The participants were selected by multi-stage random sampling technique. There were 22 marine fish landing centres in South Goa which were divided into three zones: major, medium and minor. A fishing landing centre was selected from each zone to obtain the required sample size (Fig. 1).

DATA COLLECTION

A survey proforma designed with the help of WHO Oral Health Assessment Form (1997) [13] consisted of three sections: (1) Demographic data including name, age and occupation; (2) Method of tooth cleaning; (3) Clinical parameters assessed were the dentition status, OHI-S [14] and treatment needs. On predetermined dates the examiners visited the settlements around the fish landing centres of South-Goa where 200 fishermen and 200 non-fisher-

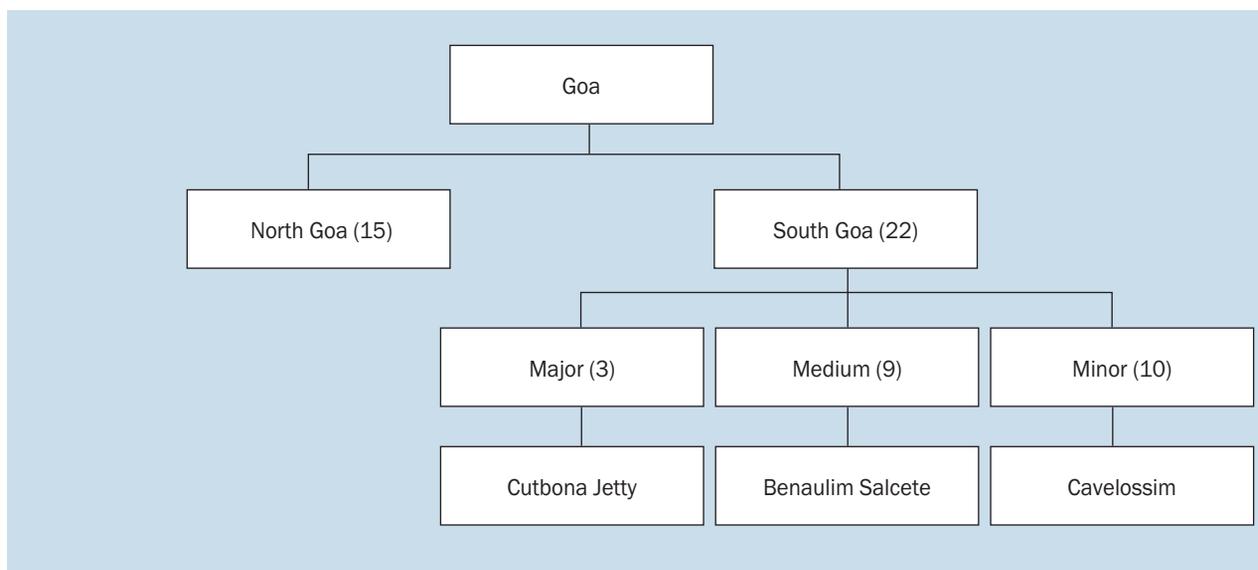


Figure 1. Multi-stage random sampling for the selection of study participants in South Goa

men belonging to six different age groups were examined. A type III examination was carried out by the examiners under natural light and the time taken for each subject was around 10 minutes.

STATISTICAL ANALYSIS

The recorded data were entered in Microsoft Excel 2019 and analysed using IBM-SPSS® Statistics-Version 21 (IBM, USA). Descriptive statistics were computed, which included percentages, means and standard deviations. The normality of the data distribution was determined using the Shapiro-Wilk test. Chi-square test was used to check for the association between the study variables among the participants. Mann-Whitney U test and Kruskal-Wallis test were performed to check for any significant differences in the study parameters. Multiple linear regression and binomial logistic regression analysis were also performed. For all the tests, confidence level and level of significance were set at 95% and 5%, respectively.

RESULTS

Among the 400 participants, 288 (72%) were found to be males and 112 (28%) were found to be females. The mean age of fishermen and non-fishermen were 28.55 ± 8.93 and 32.13 ± 15.60, respectively (Table 1). Occupation was significantly associated with caries prevalence (p < 0.001), OHI-S score (p < 0.001), oral hygiene aid (p = 0.02) and the treatment need (p < 0.001) when Chi-square test was used.

Among fishermen, 57% were not using a toothbrush and toothpaste as their oral hygiene aid, whereas in non-fishermen 97% used. Kruskal-Wallis test depicted that there was a statistically significant (p < 0.001) difference in the

Table 1. Distribution of study population by age and occupation

Age [years]	Fishermen (n = 200)	Non-fishermen (n = 200)
20–29	132 (66%)	128 (64%)
30–39	38 (19%)	18 (9%)
40–49	26 (13%)	16 (8%)
50–59	0 (0%)	24 (12%)
60–69	4 (2%)	4 (2%)
70–79	0 (0%)	10 (5%)
Mean ± SD	28.55 ± 8.93	32.13 ± 15.60

All values are expressed as frequency with percentages (in parentheses); SD – standard deviation

oral hygiene aids used among the participants (Table 2). The prevalence of dental caries among fishermen and non-fishermen were 82% and 54%, respectively (Fig. 2) and their mean Decayed, Missing and Filled Teeth (DMFT) index score was 4.10 ± 3.15 and 1.94 ± 1.46, respectively (Fig. 3). Mann-Whitney U test depicted that there was a statistically significant difference in caries prevalence (p < 0.001) and DMFT index score (p = 0.002) among the participants. In fishermen, extraction (42.2%) followed by pulp care (23.6%) was the highest treatment need whereas in non-fishermen it was one surface filling (50.6%) (Table 3). The mean OHI-S score of fishermen and non-fishermen was 2.11 ± 1.25 and 0.93 ± 0.79, respectively (Fig. 3). Among fishermen, 46% had poor OHI-S score; in contrast to that, 80% non-fishermen had a good score (Table 2). The difference between the OHI-S score was statistically significant

Table 2. Oral hygiene status and aids used among fishermen and non-fishermen

Parameters	Fisherman (n = 200)	Non-fisherman (n = 200)	P
OHI-S score			< 0.001*
Good	46 (23%)	160 (80%)	
Fair	62 (31%)	34 (17%)	
Poor	92 (46%)	6 (3%)	
Oral hygiene aid			< 0.001*
Toothbrush and toothpaste	86 (43%)	194 (97%)	
Finger and toothpaste	64 (32%)	2 (1%)	
Finger and toothpowder/salt	28 (14%)	0 (0%)	
Chew sticks	22 (11%)	4 (2%)	

All values are expressed as frequency with percentages (in parentheses). The statistical test used: Kruskal-Wallis test; level of significance: * $p \leq 0.05$ is considered statistically significant; OHI-S – Oral Hygiene Index-Simplified

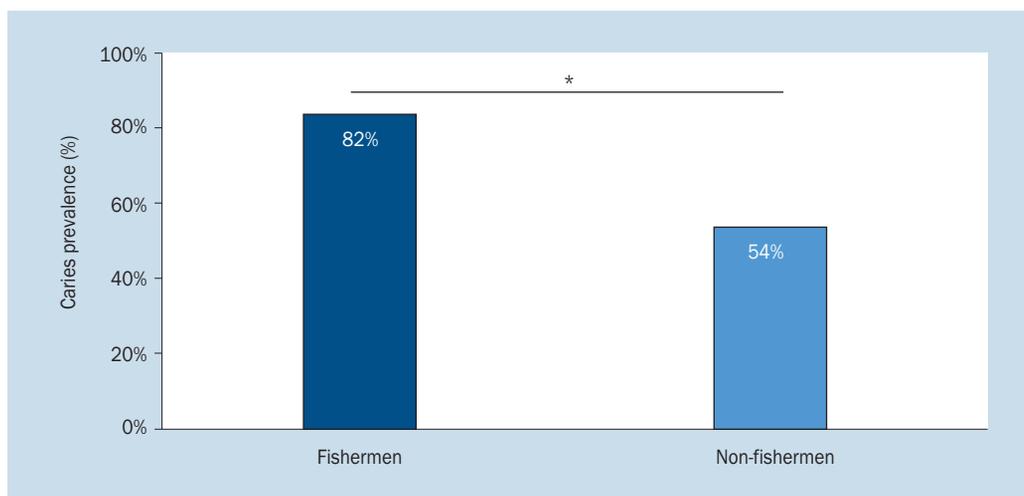


Figure 2. Comparison of caries prevalence (%) in fishermen and non-fisherman. Statistical test used: Mann-Whitney U test; *statistically significant, $p \leq 0.05$

($p < 0.001$) among the participants when Kruskal-Wallis test was used (Table 2).

ASSOCIATION BETWEEN CARIES PREVALENCE AND OHI-S SCORES WITH DEMOGRAPHIC VARIABLES AND ORAL HYGIENE AID

A significant relationship was seen using multivariate linear regression analysis between caries prevalence and OHI-S score with the model containing occupation ($p < 0.001$) and oral hygiene aid ($p < 0.001$), respectively. The dependence of caries prevalence and OHI-S score on the model containing occupation, oral hygiene aid and age were found to be 14% and 25.8%, respectively (Table 4).

When binomial logistic regression analysis was performed, it was found that fishermen had increased odds of 2.08 for acquiring dental caries when compared to non-fish-

ermen ($p = 0.008$). Among fishermen, those who didn't use a toothbrush as their oral hygiene aid were 4.5 times more likely to acquire dental caries than those who used one ($p < 0.001$) (Table 5).

DISCUSSION

The workplace of an individual cultivates certain behaviours and habits that have some direct influence on their oral health [15]. Fishing community on a global scale endures the denial of health care reforms. Fishermen's monthly wages remain bare minimum compared to other occupations due to which they pay little to no attention to their oral treatment needs [16]. Fishing is primarily a male-dominated occupation. Majority of the participants in the current study (72%) were men in their late twenties. They need to remain fit and agile in order to maximise their working ef-

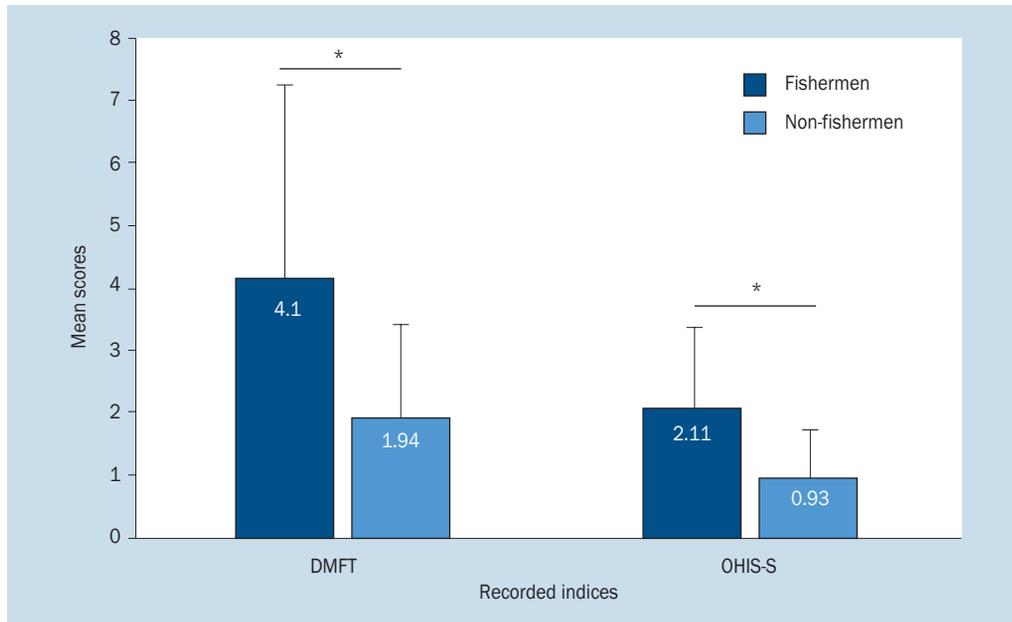


Figure 3. Comparison of Decayed, Missing and Filled Teeth (DMFT) and Oral Hygiene Index-Simplified (OHI-S) scores (mean ± standard deviation) of fishermen and non-fishermen. Statistical test used: Mann-Whitney U test; *statistically significant, p ≤ 0.05.

Table 3. Treatment needs of the population

Treatment needs	Fishermen	Non-fishermen	P
One surface filling	78 (11.5%)	182 (50.6%)	
Two or more surface filling	152 (22.4%)	92 (25.5%)	
Pulp care	160 (23.6%)	44 (12.2%)	< 0.001*
Extraction	286 (42.2%)	28 (7.8%)	
Crown	2 (0.3%)	14 (3.9%)	
Total	678 (100%)	360 (100%)	

All values are expressed as frequency with percentages (in parentheses). The statistical test used: Chi-square test; level of significance: *p ≤ 0.05 is considered statistically significant association

Table 4. Association between caries prevalence and Oral Hygiene Index-Simplified (OHI-S) with occupation, oral hygiene aid and age

Parameters	Coefficient r	SE	t	95% CI	P	Adjusted R ²
Dependent variable: caries prevalence						0.14
Constant	3.175	0.634	5.007	1.93 to 4.42	< 0.001*	
Occupation	-0.954	0.295	-3.239	-1.53 to -0.38	< 0.001*	
Oral hygiene aid	0.756	0.166	4.547	0.43 to 1.08	< 0.001*	
Age	-0.183	0.106	-1.728	-0.39 to 0.03	0.085	
Dependent variable: OHI-S score						0.26
Constant	2.648	0.256	10.354	2.15 to 3.15	< 0.001*	
Occupation	-1.018	0.119	-8.566	-1.25 to -0.79	< 0.001*	
Oral hygiene aid	0.211	0.067	3.143	0.08 to 0.34	< 0.001*	
Age	0.047	0.043	1.101	-0.04 to 0.13	0.272	

The statistical analysis used: multivariate linear regression; level of significance: *p ≤ 0.05 is considered statistically significant; CI – confidence interval; SE – standard error

Table 5. Association between caries prevalence with occupation and brushing habits

Parameters	Odds ratio	95% CI	P
Caries prevalence			0.008*
Non-fisherman	1 (Ref)	1.21–3.57	
Fisherman	2.08		
Caries prevalence of fisherman			< 0.001*
Brushing with toothbrush	1 (Ref)	2.03–9.98	
Brushing without toothbrush	4.50		

The statistical analysis used: binomial logistic regression; level of significance: * $p \leq 0.05$ is considered statistically significant; CI – confidence interval

fectiveness; nevertheless, as they grow older, they become more susceptible to musculoskeletal complications [17]. In this study, fishing occupation was substantially associated with many oral health parameters that were recorded. This indicates that fishing occupation has a definite influence on the oral health of an individual. Therefore, occupational physicians should also give importance to oral health of fishermen, as poor oral health can decrease their working efficiency.

Fishermen spend more time at sea due to which their oral hygiene practices are not up to the required standards. In previous studies, less than 25% of this population used a toothbrush and toothpaste as their oral hygiene aid, the reasons stated being low economic status and inadequate education [15, 17–19]. In this study, a relatively higher use of toothbrush was seen in fishermen (43%) which is likely attributable to Goa's high literacy rate (88.70%) that ranks fourth in the country. This finding emphasizes the importance of education which has a direct influence on the oral hygiene practice of an individual [20]. It was found that fishermen who didn't use a toothbrush as their oral hygiene aid were 4.5 times more susceptible to dental caries. Hence, the mode of cleaning the teeth was an important factor. Strategies should be established by which public health specialists could provide oral health education on brushing habits and other oral hygiene practices through various means.

Liquor taxes are low in Goa, which may lead to increased alcohol consumption among fishermen [21]. This behaviour encourages smoking and inappropriate eating habits, which when combined with poor oral hygiene practices contribute to dental caries and other oral health problems. In this study, the impact of factors such as occupation, oral hygiene aid used and age on caries prevalence was estimated to be 14%. The current study also revealed that fishermen were two times more prone to dental caries than non-fishermen and the prevalence of dental caries among fishermen (82%) was high. These findings were found to be in accordance with Asawa et al. [15] in Kutch, Rajmohan [22] in Chennai

and Bhat [23] in Uttara Kannada however it contradicts that of Saravanan et al. [24] in Tamil Nadu.

Majority of the economically disadvantaged in Goa prefer the sole state-run government dental college. Some of the participants in this study complained about having to travel a certain distance for their dental treatment and were unaware of primary health centres that offered low-cost dental care. In the current study, the DMFT index score obtained in both the groups were comparable to studies by Saravanan et al. in Tamil Nadu [24] and in Kerala [17] and Bhatt in Mangaluru city [25] but lower than M. Bhat's study in Uttara Kannada [23]. Previous studies reported that the number of restored teeth among this population were low [23, 25], implying a lack of awareness or access to proper oral health care. Extraction (42.2%) followed by pulp care (23.6%) was the most common treatment which was needed in fishermen. This indicates that caries had progressed to the point where conservative and preventive dental treatments were no longer effective and they were not provided to them at the appropriate time. This was in accordance with M. Bhat's study in Uttara Kannada [23].

In the present study, a low number of fishermen (31%) had good oral hygiene status compared to non-fishermen (80%); the reason could be fishermen used inappropriate oral hygiene aids. Occupation, oral hygiene aid, and age influenced the OHI-S score by 25.8% in this study. The mean OHI-S score of fishermen in the current study was consistent with findings from Sanadhya et al. [26] in Kutch, but lower than Lodagala et al. [27] in Andhra Pradesh.

Fishermen play an essential role in "Blue Economy" put forward by the World Bank for sustainable use of ocean resources [28]. To accomplish these sustainable development goals, the World Dental Federation believes that oral health should be integrated into general healthcare systems, particularly in developing nations [16]. International Labour Organization mandates oral health assessment be included in a seafarer's medical examination and performed at least once every 2 years [29]. Health care administrators in India should consider a similar routine medical and oral

examination for the fishermen, as they are prone to not only dental caries but also other oral mucosal lesions [19]. Teledentistry assisted by community health workers may be a viable option for fishermen with inaccessible dental care. It has the potential to decrease treatment cost and can be integrated with electronic health records which is easily available to any dental care professionals [30].

LIMITATIONS OF THE STUDY

The limitation of this study being, the very cross-sectional nature of it because of which the temporal relationship between the lifestyle factors and oral health status could not be established. A longitudinal study of the same target group is needed to identify the risk factors that contribute to the development of oral disease.

CONCLUSIONS

Oral health among fishermen in South Goa was poor as they had high caries prevalence, poor oral hygiene status and used inappropriate oral hygiene aids. They required extensive dental treatments in comparison with non-fishermen. Effective oral health education and caries preventive programs are needed among the fishermen population.

Conflict of interest: None declared

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