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Standardised Practice-Based Oral Health Data Collection: A Pilot Study in Different Countries

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ABSTRACT

Background: The Oral Health Observatory (OHO), launched in 2014 by FDI World Dental Federation, aims to provide a coordinated approach to international oral health data collection. A feasibility project involving 12 countries tested the implementation of the methodology and data collection tools and assessed data quality from 6 countries.

Methods: National dental associations (NDAs) recruited dentists following a standardised sampling method. Dentists and patients completed paired questionnaires (N = 7907) about patients' demographics, dental attendance, oral health—related behaviours, oral impacts, and clinical measures using a mobile app. In addition, participating dentists (n = 93) completed an evaluation survey, and NDAs completed a survey and participated in workshops to assess implementation feasibility.

Results: Feasibility data are presented from the 12 participating countries. In addition, the 6 countries most advanced with data collection as of July 2020 (China, Colombia, India, Italy, Japan, and Lebanon) were included in the assessment of data quality and qualitative evaluation of implementation feasibility. All NDAs in these 6 countries reported interest in collecting standardised, international data for policy and communication activities and to understand service use and needs. Eighty-two percent of dentists (n = 76) reported a patient response rate of between 80% and 100%. More than 70% (n = 71) of dentists were either satisfied or very satisfied with the patient recruitment and data collection methods. There were variations in patient oral health and behaviours across countries, such as self-reporting twice-daily brushing which ranged from 45% in India to 83% in Colombia.

Conclusions: OHO provides a feasible model for collecting international standardised data in dental practices. Reducing time implications, ensuring mobile app reliability, and allowing practitioners to access patient-reported outcomes to inform practice may enhance implementation.

Introduction

Standardised, international data on oral conditions and health care services are needed to effectively evaluate and plan oral health policies and services. Across countries, they can enable comparisons of the impact of different health policies and benchmarking of oral health and services for advocacy purposes.[1] However, such data are currently lacking, in part due to the high costs of conducting

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national oral health surveys and the complexity of coordinating standard approaches internationally.[2−4]

To facilitate the collection of internationally standardised oral health data, FDI World Dental Federation (FDI) and the International Consortium for Health Outcomes Measurement (ICHOM) developed a set of oral health outcome measures, the FDI-ICHOM Adult Oral Health Standard Set (AOHSS), that covers a comprehensive spectrum of patient-centred oral health outcomes.[5]

In parallel, FDI established the Oral Health Observatory (OHO) project to provide a mechanism for data collection. OHO seeks to collect robust data that can be used to understand patterns of oral health and dental services at a national level and provide international comparisons. Data on oral health care will importantly provide insights from both service providers and service users and also combine these with data about dental practices and service delivery. This will allow the comparison of patient-reported oral health measures with clinical data to consider the impact of oral conditions, assess treatment needs and expectations, and assess how dental service characteristics may influence patients' oral health and behaviours. It could also complement epidemiologic data by providing an inexpensive data collection method to partly fill data gaps when national oral health surveys are not feasible.

The aim of this study was to pilot a standardised international oral health data collection instrument in routine clinical dental practice and evaluate its feasibility.

Twelve countries were involved in this initial phase of the OHO project: Armenia, China, Colombia, Germany, India, Italy, Japan, Kenya, Lebanon, Poland, South Africa, and Tanzania. Oral health data are reported from the 6 countries most advanced with data collection as of July 2020, when the project stopped due to the COVID-19 pandemic: China, Colombia, India, Italy, Japan, and Lebanon.

Methods

Study design

This was a cross-sectional, analytical observational study. A mobile app containing 2 separate questionnaires, one completed by the patient and the other by the dentist about the patient's clinical oral health status, was used to generate data in dental practice. A third online questionnaire collected information from dentists about the dental practices in which data were collected. All variables are listed in Supplementary Table 1.

To evaluate implementation feasibility, 6 national dental associations (NDAs) and 191 dentists who had completed or nearly completed data collection by April 2020 were sent an anonymous survey. Responses were received from 5 NDAs and 93 dentists by November 2020. Additionally, 2 workshops were organised in November 2020 with the 6 NDAs. Feasibility data relating to dentist recruitment and the time required to collect data are presented from all 12 participating countries.

Questionnaire development

The 3 questionnaires about patient oral health and dental practice characteristics were developed through expert consensus.[1] Clinical and patient-reported oral health measures were selected from commonly used measurement instruments.[5] Over 3 review rounds, the expert group selected the measures considered most important for assessing oral health and its determinants in dental patients. Questionnaires were translated into the appropriate languages by professional translators and verified by NDA staff fluent in English.

Country selection

To test the application of the tools and methodology in diverse settings, the study was open to FDI member NDAs with the capacity to implement the study protocol. Countries without an active FDI member NDA or where the NDA was not willing or able to participate were ineligible.

Dentist sampling and recruitment

A stratified cluster sampling method was used to select sites. For each NDA that showed an interest in participating in the study, registered dentists were clustered according to the primary administrative division (e.g., state, province) in which they were located. The number of dentists to be recruited in each cluster was set according to the proportion of the national population living there. Then, dentists were randomly selected per cluster from the list of all dentists in that cluster. A minimum sample of 24 dentists per country was set, in line with common sample sizes used in feasibility studies that do not seek to estimate effect size.[6] Participating dentists were sent the guidance document in Appendix A before beginning the study.

Patient sampling and recruitment

A modified systematic sampling method was used to sample participants amongst all patients attending the dental clinic during the study period. One patient was surveyed each working day according to the order in which they arrived in the practice; on the first day of the study the first patient was surveyed, on the second day of the study the second patient was surveyed, and so on. If the selected patient declined, the following patient was invited to participate. This methodology provides a simple sampling technique, without the need for additional tools, to minimise the risk of error or dentist dropouts.

Participating patients received the information sheet in Appendix B. Fifty patients per dentist were surveyed. To be eligible, patients had to be able to give informed consent and be a resident in the study country. For children younger than 12, parents gave proxy consent. Consent was obtained through the mobile app.

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[1] Questionnaires were developed by 4 experts with specialisation and experience in dental public health, global oral health, and general dental practice.

Table 1 – Dentist recruitment per country.

Country	Data collection status by July 2020	No. of dentists in sample	Recruitment period	Proportion of dentists in country included in study population[a]
Armenia	Ongoing	27	36 weeks	49%
China	Ongoing	70	40 weeks	27%
Colombia	Ongoing	26	21 weeks	8%
Germany	Ongoing	27	N/A	69%
India	Ongoing	75	4 weeks	28%
Italy	Ongoing	27	6 weeks	50%
Japan	Completed	29	34 weeks	51%
Kenya	Not started	25	N/A	21%
Lebanon	Ongoing	26	8 weeks	67%
Poland	Not started	29	N/A	N/A
South Africa	Ongoing	26	N/A	51%
Tanzania	Not started	26	37 weeks	37%

Countries in bold are those with data included in the present study.

[a] Proportion is calculated using the number of dentists registered with the participating national dental association and the number of dentists in the country according to the World Health Organization Global Health Observatory (https://www.who.int/data/gho).

Data collection

Data were encrypted when stored on the app and transferred to FDI's secure servers. Patients completed the patient questionnaire using a tablet computer whilst waiting to begin their appointment. The dentist completed the dentist questionnaire during the appointment or later using the patient record. Dental practice data were collected one time only via an online survey.

Implementation and monitoring

NDAs obtained appropriate ethical approval according to national regulations. Several NDAs organised training workshops or individual calls with participating dentists.

Data analysis

A preliminary descriptive analysis of 6 countries was carried out, which included detailing each survey variable and segmenting the data according to country and key demographics (e.g., age, sex).

Results

By July 2020, OHO was being implemented in 12 countries. At this point, data collection had stopped in all countries due to the COVID-19 pandemic. The below results report the oral health data and evaluation survey and workshop responses from the 6 countries most advanced with data collection. Data about country and dentist recruitment recorded during project implementation are also reported.

Country recruitment

Country recruitment began in May 2017. Twenty-two countries responded to the call to run the study nationally and were invited to participate, and 10 accepted. A further 2 countries contacted FDI to request to join the project. Reasons for declining to participate included conflict with planned national oral health surveys, national political and/or economic instability, and inability to commit the required resources to the project.

Three of the twelve recruited countries had not started data collection when the project was put on hold in July 2020, mainly due to the length of the ethical approval process.

Dentist recruitment

Table 1 shows the number of dentists recruited, the recruitment period, and the proportion of dentists within each country that are a member of the NDA and therefore included in the study population.

The median length of time taken to complete dentist recruitment was 27.5 weeks. Three out of five NDAs that completed the relevant questionnaire reported that dentist recruitment was amongst the main challenges they faced and that the time implications for dentists was the main barrier. Four of five NDAs reported that the time commitment of the study was the main reason for dentist dropouts. In countries that had started data collection, the dentist dropout rate was 19%.

Patient recruitment

Eighty-two percent of dentists (n = 76) reported an acceptance rate of between 80% and 100% of patients invited to participate in the study. Seventy-seven percent (n = 71) of dentists were either satisfied or very satisfied with the patient selection method. The most common reasons for patient nonparticipation reported by dentists were lack of time (63%, n = 59) and not being interested in the topic (27%, n = 25). Dentists' evaluation of the patient recruitment procedures is detailed in Supplementary Table 2.

Data collection, mobile app, and questionnaires

Fourteen percent of dentists reported that data collection took longer than 50 working days, most commonly due to

Table 2 – Data collection status of dentists and number of patients surveyed per country.

Country	Proportion of dentists having started data collection	Proportion of dentists having finished data collection	Median No. of patients surveyed per dentist	Length of data collection period
Armenia (n = 27)	48%	0%	0.5	6 weeks
China (n = 70)	90%	43%	40.5	70 weeks
Colombia (n = 26)	96%	77%	50	48 weeks
Germany (n = 27)	22%	0%	0	6 weeks
India (n = 75)	75%	27%	28	123 weeks
Italy (n = 27)	89%	44%	39.5	105 weeks
Japan (n = 29)	100%	93%	50	52 weeks
Lebanon (n = 26)	100%	84%	50	38 weeks
South Africa (n = 26)	35%	4%	0	29 weeks

problems with the app and data synchronisation. Most dentists were satisfied (48%, n = 45) or very satisfied (25%, n = 23) with the use of the mobile app for data collection. During the workshops, NDAs reported some problems related to the app; however, they also noted the advantages of the method used, notably the lower cost compared to other national-level data collection projects. Problems included missing data and trouble submitting responses in rural areas in some countries due to slower internet connections.

Table 2 shows the data collection status per country and the median number of patients surveyed by each active dentist. In no country did all dentists complete the data collection, and only in Japan and Lebanon did all recruited dentists start data collection. As shown by the length of data collection periods, dentist recruitment and data collection took longer than planned in all settings.

Use of results

All NDAs stated that they intend to use the results to advocate for improved oral health policies and for communication campaigns, mentioning the importance of international standardised data for benchmarking. They suggested that the data could be used to understand patterns of dental service use and reasons for not attending and to advocate better care integration. Some NDAs mentioned that in the absence of recent national oral health survey data, OHO results could provide insights into oral disease prevalence and determinants at a national level.

Amongst dentists, only 17% said they had adapted their clinical practice due to participation in the OHO project. However, 89% stated that they would want to be able to access their patient's individual responses, to inform patient communication and education (49% of dentists, n = 46), or to inform treatment decisions (40% of dentists, n = 37). Dentists' feedback about the data collection process and intended use of results is detailed in Supplementary Table 2.

Preliminary results of data collection

Supplementary Table 3 describes patient demographics, oral health-related behaviours, and oral health outcomes from the 6 countries most advanced with data collection.

Patients' mean age was older in Italy (45 years) and Japan (53 years) than in the other countries, where mean patient

age was between 36 and 39 years. India had the greatest sex-related difference in dental attendance, with 39% of patients being female.

Figure 1 shows the variation across countries in patients self-reported brushing frequency and sugar consumption. Between 78% and 83% of patients reported brushing twice or more per day in all countries except Lebanon and India. Patients in China and India predominantly brush their teeth before breakfast, whilst those in Colombia, Italy, and Japan are more likely to do so after breakfast. In India, patients reported the highest sugary food consumption frequency, with 32% of patients answering twice a day or more, compared with 11% in China. In all countries, most patients had visited a dentist in the last year, ranging between 51% in India and 80% in Japan. Patients in China and India were the most likely to have never visited a dentist.

Amongst patients who had not visited a dentist in the past year, the most common reported reasons were their dental problems not being serious enough, being too busy, being afraid of or not liking dentists, or having nothing wrong with their teeth.

Figure 2 shows the self-rated oral health of patients. Patients in all countries were most likely to rate their oral health as "good" or "very good," except in Japan where more patients rated their oral health as "poor" or "very poor." Oral impacts were common in all countries and followed similar patterns. Between 24% and 47% of patients had experienced pain, and between 20% and 36% had experienced difficulty eating or chewing during the last 12 months due to problems with their mouth or teeth.

Figure 3 shows the results of 2 dentist-reported variables. Periodontal status varied across countries, with 23% of patients in Japan being categorised as having a healthy periodontal status vs 56% in Colombia. The mean number of untreated caries in patients ranged from 1.8 in Japan to 3.7 in Lebanon.

Discussion

The successful dentist recruitment and dentists' high levels of satisfaction with the methodology demonstrate the feasibility of collecting data through dental practices. The high patient participation rates indicate that the methodology is acceptable to patients. This is aligned with previous studies that have suggested the feasibility of collecting both patient-
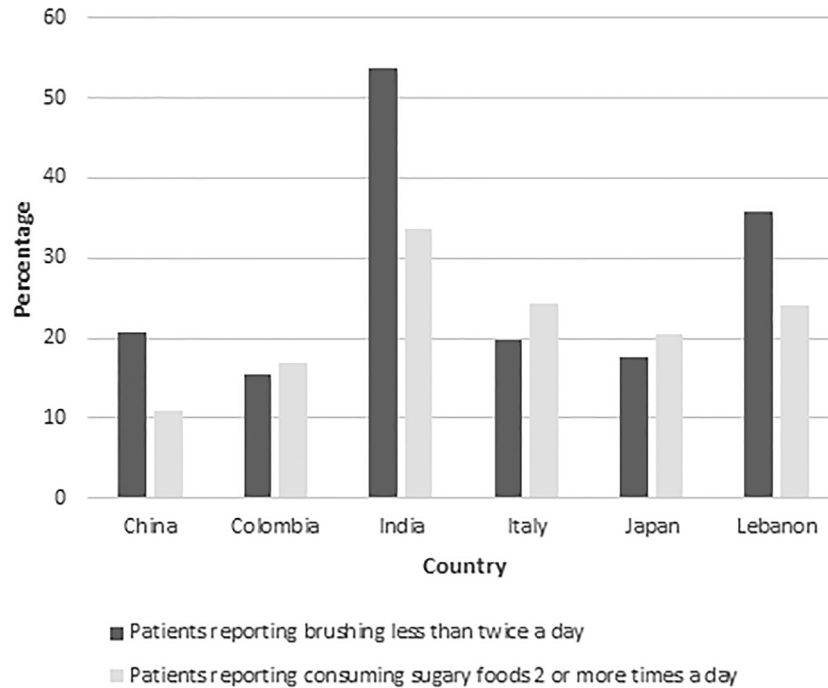
Fig. 1 – Toothbrushing frequency and sugar consumption.

reported health data and clinical oral health data in health care settings[7,8] and the feasibility of using mobile apps for practice-based data collection.[9] The results of this study suggest that such methods can be used across diverse countries and to collect data relevant for both clinical and policy objectives. The time taken to begin study implementation varied notably across countries, mostly due to the ethical approval process and resources available to dedicate to dentist recruitment. Similarly, data collection took longer than intended in all cases, due in part to the need to replace dentist dropouts.

Overall, countries should expect project implementation to take more than 1 year.

Several lessons can be drawn to inform future data collection efforts. Further financial support to countries and adapted implementation periods to avoid clashes with other national surveys may help increase country participation. Efforts to demonstrate the value of the research and assist people in using the mobile app should be made to avoid potential sources of sampling bias. Testing of data collection apps in all project settings and with large quantities of data
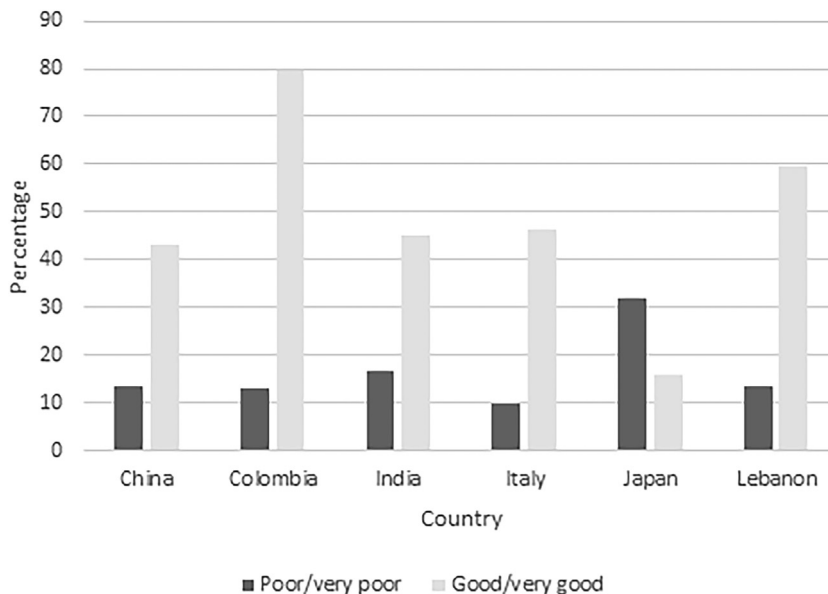
Fig. 2 – Self-rated oral health.
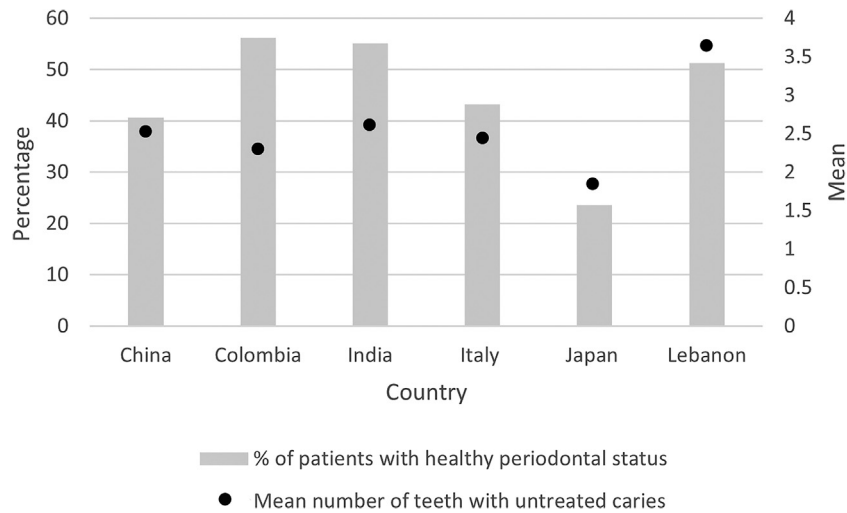
Fig. 3 – **Periodontal status and teeth with untreated caries.**

may help identify problems before implementation. These lessons are similar to those that have been discussed in other projects outside of dentistry. For a example, a study assessing the feasibility of collecting physical activity measures though a smartphone app noted the importance of data feedback and personalisation to improve acceptability of the tool.[10] Other studies using mobile app–based surveys in low-income settings have discussed challenges related to internet connection and device charging that can be barriers to data collection and transfer.[11,12]

The results also demonstrate the potential implications and value of such data collection initiatives. Variations in risk factors such as sugar consumption and dental attendance highlight the need for tailored oral health promotion programmes and policies per country. For example, in India, the country where patients most frequently reported consuming sugar twice a more times per day, a recent initiative launched by the Indian Dental Association and FDI identified several population-level priority actions to reduce sugar consumption.[13] Based on these initial results, it may also be important to prioritise behavioural interventions to improve toothbrushing frequency in India and Lebanon given lower rates of twice-daily brushing, a suggestion in line with other published studies.[14,15] In Italy, health authorities may choose to focus on promoting tobacco cessation services,[16] particularly in dental practice. Demographic segmentation or data collection in specific population groups could help further target these activities. This information would be valuable in informing population-level interventions in lower-resource settings, where the financial costs required to conduct nationally representative population surveys is prohibitive.[17]

Information about patients' self-rated health and oral impacts show the potential to evaluate care needs and expectations or identify service gaps.[18–20] For example, the relatively high number of patients reporting pain experiences in Lebanon may suggest a need for improved access to or demand for preventive dental care. Patient demographic data may also be used to identify access issues in specific population groups. In a larger study, segmentation of data by geographic region or dental practice type could inform the

development of more targeted access programmes.[21] Furthermore, combining subjective and clinical oral health outcomes as well as behavioural measures (all of which are collected as part of the OHO data collection tool) can be helpful in identifying treatment needs for population groups and targeting services accordingly.

Understanding patients' expectations and oral impacts can also be used in making treatment decisions and evaluating care outcomes.[5,20] This is reflected in the high proportion of participating dentists who would like to access individual patient responses to inform patient communication and treatment decisions. To draw further insights into care access, affordability, and quality, additional questions related to the treatments and services provided, equipment used, and care costs could be integrated into the questionnaire about dental practice characteristics.[22,23] Further analysis and consideration of national and regional/local context are also needed to understand what may be driving these variations and how they can be addressed.[24]

There are limitations to the described methodology, related to the representativeness of data collected in the dental practice using a mobile app. Care should be taken not to overinterpret the preliminary results. This does not take the place of a national epidemiologic survey, but in many countries these are neither affordable nor feasible. The study does provide important information about the oral health status and attitudes of patients attending for dental treatment, which is relevant for developing oral health policy and services. It should also be noted that the project was implemented by FDI member associations, which may result in a more positive evaluation of the project implementation and feasibility. To counter this, the evaluation surveys were run anonymously and NDAs were reminded of the importance of frank and open feedback prior to the evaluation workshops.

Conclusions

This study demonstrated the feasibility of collecting international standardised data in dental practices using a

mobile app and the interest amongst dental practitioners and national associations in using patient-reported outcomes to inform clinical practice. OHO may provide an affordable and robust way to conduct standardised oral health surveys.

Conflict of interest

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Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.identj.2023.02.002.

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