Development and Validation of “Basic Oral Health Assessment Tool” (BOHAT) for Non-Dental Healthcare Professionals for Indian Adult Population: A Mixed Method Research

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Abstract

Background: Oral health is a significant indicator of general health, wellbeing, and quality of life. The prevention of oral health problems requires the periodic inspection of the oral cavity. Routine oral health examinations to individuals appears to be one way to deliver quality oral health care but is too often missed as an opportunity for improved oral health in the non-dental healthcare setting in India. This because of limited training and nonavailability or lack of specialized oral health assessment tools.

Objective: The current study will be focused on the development, validation, and implementation of Basic Oral Health Assessment Tool (BOHAT) to improve the oral health assessment capabilities of non-dental healthcare professionals and thus contribute to improved overall health outcomes of the Indian adult population.

Methods: This study will be a mixed method, multistage study conducted in 3 stages. Study will be carried out among 708 non dental healthcare professionals in 33 Primary Health Centres (PHCs) of Mangalore taluk, Karnataka. Ethical approval was sought from the institutional ethics committee of Manipal College of Dental Sciences Mangalore. Informed consent will be obtained from every participant prior to the study. Literature review and qualitative interviews will be used for item and domain generation with respect to BOHAT; an expert panel review and pilot testing for refinement; and, finally, statistical analyses for validation of reliability and consistency. The second phase will involve capacity building and user experience exploration through comprehensive trainings for non-dental health professionals using audio and visual aids, with hands-on learning methodologies, including relevant feedback processes in the form of focus group discussions. The third stage will check the effectiveness of BOHAT regarding the changes in knowledge, attitude, and practices through pre- and post-training questionnaires, which will then be followed by a retention analysis three months later.

Results: The current study will be complemented by in-depth qualitative and quantitative analysis. The results of the study will then be presented at relevant scientific conferences and professional meetings as oral presentations and published in academic journals.

Conclusions: The BOHAT study holds huge potential for promoting oral health care through collaborative and interdisciplinary approaches. It will accomplish early diagnosis, timely referrals, and comprehensive care by integrating assessment actions for oral health into routine practices of non-dental primary health care professionals. Clinical Trial: Not applicable

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Keywords: Oral health assessment, Non-dental healthcare professionals, India, adults, Development, Validation, Interdisciplinary, mixed method

INTRODUCTION

Oral health is a significant indicator of general health, wellbeing, and quality of life (1). The functioning of the oral cavity, teeth, and orofacial structures, which enables people to perform fundamental bodily activities like eating, respiration, and speaking, is commonly referred as oral health and it undergoes changes throughout the various stages of life, from early childhood to advanced age (2,3). Oral health problems can have a significant effect on people's quality of life, interpersonal connections, general well-being, and self-esteem (4). Therefore, emphasizing the importance of preventive measures and early detection of oral diseases becomes crucial in mitigating the likelihood of developing subsequent challenges impacting both oral and overall health.

Oral health assessments serve as a good indicator of disease risk, the proper management of existing disease, and even the improvement of health outcomes because of appropriate oral health care (5). The prevention of oral health problems requires the periodic inspection of the oral cavity. Routine oral health examinations to individuals appears to be one way to deliver quality oral health care but is too often missed as an opportunity for improved oral health in the non-dental healthcare setting (6). From the Allopathic doctor (physician and surgeon) to professionals, AYUSH practitioners, nurses, auxiliary nurse midwives, and community health workers (7) are very essential in delivering holistic healthcare but have a limited capacity to assess and intervene comprehensively on oral health issues because of their very limited training alone and nonavailability or lack of specialized supportive tools adapted to suit the population. This might ultimately delay the diagnosis and institution of appropriate interventions for oral health conditions in such patients and increase the possibility of further disease progression, which will then compromise the overall health outcome.

The separation between oral health and general healthcare practices may contribute to the insufficient integration of oral health assessments into routine healthcare protocols, limiting the overall effectiveness of healthcare delivery. Screening of oral health, early detection and triage of oral health issues, and immediate referral to dental specialists ultimately require the integration of front-line

health care professionals (8). Several instruments for evaluating oral health have been developed over time for use by healthcare providers. A few of these tools are the Holistic Reliable Oral Assessment Tool (THROAT) (6), the Revised Oral Assessment Guide (ROAG) (9), the Oral Health Assessment Tool (OHAT) (10), and the Oral Assessment Guide (11). But the existing tools in use lack reference pictures, challenging the completeness, relevance, and clarity of wording (12).

To bridge this gap, the present research aims at developing, validating, and implementing a Basic Oral Health Assessment Tool (BOHAT) that is tailored for use by non-dental health professionals working with populations aged 18 years and above in India. BOHAT will be a screening tool for health professionals who are not dentists, to enable rapid identification of the need for referring patients for dental consultation. This tool will further empower non-dental healthcare professionals in the performance of effective oral health assessment, thereby addressing an emerging critical need for holistic healthcare approaches at large. The current study would be focused on the development, validation, and implementation of BOHAT to improve the oral health assessment capabilities of non-dental healthcare professionals and thus contribute to improved overall health outcomes of the Indian adult population.

METHODS

This study will be a mixed method, multistage study conducted in 3 stages. Stage1 focuses on the development and validation of the tool. Stage 2 involves capacity building and user experience exploration and stage 3 aims to check the effectiveness of BOHAT using a pre- post intervention study (Figure 1).

Figure 1: Multistage of the study

Study setting

The study will be carried out in the Primary Health Centers (PHCs)located within Mangaluru Taluk of Dakshina Kannada District. This selected study setting would enable insights into the applicability and effectiveness of the developed tool, BOHAT, under Mangaluru Taluka's healthcare infrastructure. In this approach, the oral health assessment practices will be examined more precisely and contextually in relevance to the geographic area selected. PHCs in this region would be the primary sites for data generation, collection, pilot testing, validation studies, and execution of training programs for non-dental health professionals. Written consent will be taken from District Health Officer, Dakshina Kannada, Karnataka.

Sample size

Mangalore taluk comprises a total of 33 Primary Health Centers (PHCs), with a distribution of 10 Urban PHCs and 23 Rural PHCs. Non-dental healthcare professionals, including Allopathic doctors (physician and surgeon), AYUSH practitioner, nurse, auxiliary nurse and midwife and community health workers (13). Within the Urban PHCs, there are 216 non-dental healthcare and allied healthcare professionals, while the Rural PHCs have a workforce of 488 non-dental healthcare and allied healthcare professionals. The inclusive nature of this study aims to involve all 708 non-dental health professionals across all 33 PHCs in Mangalore Taluk who will provide their consent for participation. This broad and comprehensive approach will ensure a representative sample that holds a diverse group of healthcare professionals within this taluk.

Study framework

Basic Oral Health Assessment Tool will be designed as a paper-based instrument with the inclusion of reference pictures. These reference images serve as visual aids to enhance and facilitate the oral health assessment process**.**

Stage 1: Development and validation of BOHAT

Stage 1 have four substages (Figure 2)

Substage A: Items and domains development

Literature search will be conducted to obtain data on oral health, oral hygiene, common dental problems among Indian adult population. An in-depth qualitative interview will be undertaken with non-dental health professionals to explore the challenges and complexities inherent in oral health assessment. Additionally, this approach aims to identify key domains that should be incorporated into the Basic Oral Health Assessment Tool. Collaboration with oral healthcare experts from Public Health Dentistry, Oral medicine and Radiology, Oral Pathology, Oral surgery, Periodontics, Endodontics and Prosthodontics, to identify relevant and essential oral health problems specific to the Indian adult population will be done.

Photographs for BOHAT will be sourced from patients availing of camps organized by the Department of Public Health Dentistry, Manipal College of Dental Sciences, Mangalore. These photographs will range over a vast spectrum of conditions and scenarios pertaining to oral health, thereby presenting a sample of what non-dental health professionals might encounter during their assessments. Prior to photographing, proper ethical consent will be taken from the patients. The photographs will be taken personally by the principal investigator after he undergoes training in intraoral photography. This will help in maintaining uniformity so that the image collection and image capturing follow the standardized procedures. Images are identified and selected by subject experts as suitable for use in BOHAT and will be carefully identified.

Substage B: Item refinement and item reduction

Items on the BOHAT will be subjected to thorough reviews and discussions with the expert panel so that valuable insights into clarity, relevance, and appropriateness can be elicited. Systematically, content validity index for each of the items in BOHAT will also be computed. Items with very low CVI scores may be further revised to enhance their content validity. Item reduction will be based on the Content Validity Index and other approaches, where items with lower scores may have to face further revision or even removal in trying to proceed with the finest tool containing only the most

valid and most relevant items possible.

Substage C: Pilot testing and item refinement

Pilot testing of the tool will be conducted among 20 sample of non-dental health professionals to evaluate usability and gather feedback and items of BOHAT will be refined based on pilot testing results.

Stage D: Validation and finalisation of the content

Face validity: The views of dental professionals will be sought to incorporate adequate validation to ensure accuracy, reliability, and clinical relevance to BOHAT. Qualitative evaluation among potential users, stakeholders, or even experts will be conducted for BOHAT's face validity.

Construct validity: Identify existing, validated tools or assessments that measure similar or related constructs to oral health. Compare with BOHAT. These comparison measures will act as benchmarks against which to explore the construct validity of BOHAT. A sample of non-dental healthcare professionals will administer BOHAT. Administer simultaneously with the selected comparison measures to the same sample. In the present research, for each subject, BOHAT scores and scores on the comparison measures will be obtained. Statistical analyses, including calculation of correlation coefficients, will be conducted to examine the relationships between BOHAT scores and the scores on the comparison measures. Positive and significant correlations support construct validity in terms of BOHAT.

Inter-rater reliability: Multiple non-dental health professionals will use BOHAT independently on the same subjects, and scores will be checked for agreement. The analysis of ratings given by several raters can be done with statistical metrics like Cohen's kappa or the intraclass correlation coefficient (ICC). High agreement between the raters reveals good inter-rater reliability.

Internal consistency: Cronbach's alpha will be computed as a measure for the items' internal consistency as to how consistently it is measuring what had been purposed. Cronbach's alpha ranges from 0 to 1. A higher value of alpha reflects greater internal consistency of the items. Standardization

regarding the scoring criteria of BOHAT on a consensus basis through the collective opinions and experts' opinion on the subject matter will help insure uniformity and objectivity of assessments.

Translations: Translation of BOHAT to Kannada language (local language) and back translation will be done with the help of linguistic experts.

Figure 2 : Conceptual framework for development and validation of BOHAT

Stage 2: Capacity building and user experience exploration

The training modules will have the details on the purpose of BOHAT, its procedure for administration, and interpretation of the results. Experts will be given this module, and for content and face validity, they will be invited for classification of need for each question according to a 3-point Likert scale into three categories : 'necessary', 'useful but unnecessary' and 'unnecessary'. Depending on the expert opinion, the contents will be modified. The BOHAT training module will therefore adopt a multi-modal mode of learning: audio, visual, and audio-visual modes. This will ensure maximum benefits from training sessions so that better understanding and actual application in oral health assessment practices can be achieved.

The module for the training will include how to navigate the tool, interpret the results, and communicate the findings efficiently to the patients. Hands-on training sessions will be conducted regarding the practice of using the tool. Focus group discussion with non-dental health professionals will be carried out for exploring the experience of the participants, challenges faced by them, and perception about BOHATs usability.

Training module

This training module is of 4 hours duration and will be delivered using a combination of audio, visual, and audio-visual aids. Such comprehensive training on common problems of oral health among the adult population in India shall draw upon a variety of subjects to provide the necessary background to a health professional. The module will initiate with an overview of the role of health

professionals in disseminating awareness regarding oral health problems and the importance of dental health in relation to overall health. Epidemiology of oral health in India will be presented with data on the most common oral health problems among adults.

The module will consider specific oral health problems often seen in adults. It will cover in-depth the processes of dental caries, periodontal diseases, tooth sensitivity, the association of tobacco with oral health, potentially malignant disorders and oral cancer, other oral lesions, and the risk factors and lifestyle factors affecting oral health, like diet and lifestyle, and at the same time, the emphasis will be on early detection and prevention. The module will cover potential solutions to improve access and further incentivize health professionals to incorporate oral health discussions into their practices. The training will be completed with key takeaways, underscoring the importance of oral health awareness and preventive measures. An interactive question-and-answer session will be provided, and participants will have time to share their experiences and discuss special concerns.

Stage 3: Evaluating the effectiveness of BOHAT

A validated questionnaire will be used by a non-dental health professional before the training session to gauge their baseline knowledge, attitude, and practice regarding oral health assessments. The same questionnaires administered after training will help in assessing the impact and effectiveness of BOHAT on knowledge, attitudes, and practices of non-dental health professionals. The scores obtained from the post-test of BOHAT will be compared with benchmarks as observed by dentists. This comparative assessment is purposed to establish the effectiveness of BOHAT through the tool's degree of conformance with existing standards in dental practice. A retention analysis will follow three months after the post-test for evaluation and measurement of the retained knowledge and acquired skills during training sessions. Results of the retention analysis will rate how effective training is when applied and effective in the long run to help modify or reenforce the practice of oral health assessment.

Ethical considerations

The Declaration of Helsinki principals will be followed while conducting the research (14). Ethical approval was sought from the institutional ethics committee of Manipal College of Dental Sciences Mangalore, Manipal Academy of Higher Education. Additionally Institutional Protocol Approval Committee (IPAC), Manipal Academy of Higher Education provided approval for the study. An informed consent will have to be filled by every participant after verbal and written information regarding the study is given to them.

RESULTS

The current study will be complemented by in-depth qualitative and quantitative analysis. The results of the study will then be presented at relevant scientific conferences and professional meetings as oral presentations and published in academic journals.

Expected outcomes

The expected outcomes of the study include timely identification of oral health problems and an increase in early referral behaviour. This will improve oral health assessments by non-dental primary health care providers, oral health knowledge, attitudes, and practices of these non-dental primary health care providers, leading to enhanced collaboration with dental and other health professionals and improved training and competency. Increased access to dental care is also assured.

DISCUSSION

Overview

Oral health problems can have a significant effect on people's quality of life, interpersonal connections, general well-being, and self-esteem (4). It is, therefore, important to address the role of preventive techniques and early diagnosis of oral pathologies in reducing the risk of development of further oral-health-related complications affecting not just oral but general health as well. Oral health assessments are, therefore, an important part of estimating disease risk, supervising already existing

conditions, and even improving health if oral care (5).

Within non-dental healthcare settings in India, a critical issue emerges surrounding the insufficient attention given to oral health. Professionals like Allopathic doctors—Physician and Surgeon, AYUSH practitioner, nurse, auxiliary nurse midwife—community health workers are facing problems in assessing and addressing oral health issues of the population effectively because of lack of adequate training and non-availability of tools specialized based on the needs of Indian populations. This further complicates accurate assessment and appropriate communication of findings in the absence of any visual aids, thereby lessening generally effective oral health assessments done by non-dental professionals.

The Brief Oral Health Status Examination (BOHSE) allows carers to monitor the dental health of patients in aged care institutions who are cognitively challenged as well as those who are not. However, it has a limitation in that the study was conducted in only one nursing home, and the sample size was small (15). THROAT is another instrument for the oral evaluation of elderly hospitalized patients with medical conditions (6). The Oral Health Assessment Tool (OHAT) is an assessment tool designed for people with cognitive impairment and is easy to use by non-dental staff, such as nurses and caretakers. Nonetheless, OHAT has drawbacks, including non-significant and low correlations and percent agreements for the saliva, oral cleanliness, and dental pain categories(10). The Oral Health Screening Tool for Nursing Personnel (OHSTNP) evaluates the functioning of the mouth as well as oral health status for inhabitants in long-term care homes. While OHSTNP shows high specificity in screening lips, tongue, gums, tissues, saliva, and oral cleanliness, its sensitivity is low, indicating the need for further improvements in these categories(16).

Insufficient research has been conducted to determine how oral health assessment tools can be integrated into the routine practices of non-dental healthcare professionals. Furthermore, the literature does not adequately address the training needs among these professionals to attain effective

tool use. Evidence pertaining to the validation of the oral health assessment tools in varying clinical scenarios and patient populations is also lacking. Finally, there is a lack of literature investigating the effectiveness of enhanced oral health assessments on overall patient outcomes and preventive care. These gaps in research provide the rationale for the development and validation of BOHAT to fill these gaps with a culturally appropriate tool that is efficiently usable by non-dental healthcare professionals in India.

Beyond dentistry, oral health is important for general well-being and good health. Unfortunately, an absence of specialized instrumentation for the nondental healthcare provider often creates a barrier to early detection and treatment of oral health diseases. This calls for a comprehensive and easy-to-use instrument; hence, the need for BOHAT. It allows non-dental health care professionals to conduct an effective oral health assessment, thus addressing the paltry need for holistic approaches to health care.

Challenges and solutions

A major challenge can be a lack of awareness of the importance of oral health care among non-dental health professionals. There is a need to conduct an awareness drive with campaigns aimed at professional groups and the community. Conducting a media campaign on television, radio, print media, and social media regarding the importance of oral health and its interlinkage with general health will be very useful. Another challenge is resources and funding. A possible solution for this challenge can be the exploration of grants aimed at healthcare innovations and public health improvements. Integration into current healthcare systems presents yet another possible obstacle. Integration issues can be identified and dealt with by working closely with healthcare administrators to ensure the integration of BOHAT into existing workflows, developing clear protocols and guidelines on implementation, and then piloting the programme in a few centres prior to a wider area. There can be difficulties relating to the collection and management of data. These may be

overcome by ensuring strong systems for data management, error-free and effective collection; training health professionals in data entry and management; and digitalizing tools for data collection and analyses. For its sustainability, this program will require a long-term sustainability plan that includes periodic trainings and follow-up support for health professionals. A monitoring and evaluation framework should also be laid down for checking the program's impact, making necessary adjustments, and creating community ownership and involvement to help in sustaining interest and participation.

Strengths of the study

The BOHAT study fosters holistic healthcare that is interdisciplinary in nature by its inclusion of non-dental healthcare professionals, therefore warranting oral health becoming part of general health assessments. It builds the capacities of non-dental health professionals with training and education for better health outputs. This study aims at enhancing the capacity of non-dental health professionals in relation to the identification and referral of oral health conditions and increasing access to dental care, particularly in underserved areas. This way, early identification and intervention will help prevent the progression of these oral diseases, hence reducing the healthcare system burden—improving the quality of life of patients. The research conducted here contributes to many of the SDGs on the list, which pertains to good health, quality education, reduced inequalities, and effective partnerships.

Limitations of the study

This study may have few limitations. Full implementation and sustainability of the program with limited resources and funding may not be possible in resource-poor settings. The effectiveness of a program may vary due to variable availability of resources, quality training provided, and health infrastructure in various regions. Mixed methods research normally has greater resource requirements in terms of time, funding, and appropriately trained human resources. Data quality may

vary across the two methods. For example, qualitative data are usually subject to biases that originate from personal interpretations, while quantitative data may be subject to measurement errors or limitations of tools of data collection. Scaling up of the BOHAT study to bigger populations or regions has significant challenges. This is a long-term program that needs commitment and resources, both of which are challenging to build sustainability beyond an initial study period.

Link to Sustainable Development Goals (SDGs)

Oral health assessments are crucial for identifying problems early and preventing more severe oral and general health conditions(17).Therefore BOHAT is linked with many SDGs. The BOHAT will support the attainment of several health and well-being Sustainable Development Goals (18). It will help in supporting SDG 3: ‘Good health and well-being’ by providing a systematic approach for performing oral health assessments (19).It will help in the early diagnosis and prevention of an oral disease by building the capacity of non-dental health professionals, hence promoting health and well-being. This study align with SDG 4: ‘Quality education’ by training non-dental healthcare professionals on the use of BOHAT and promote continued education and capacity building, ensuring that healthcare professionals have proper skills for managing oral health (20). The study will help reduce inequalities in oral health, working in concert with SDG 10: ‘Reduced inequalities’(21). It will, hence, reduce health disparities in oral health outcomes but ensure access to quality health care, equitably. This will add depth to the exploration of oral health practices within a specified region, like Mangaluru Taluk, for establishing ways of reducing health inequalities. Thus, working with the main stakeholders—non-dental health professionals, PHCs, and people within the community—shall further stress the importance of partnership in line with SDG 17: ‘Partnership for goals’(22). This will help underscore the indispensability of collaborative efforts in securing the Sustainable Development Goals.

Research timeline

Figure 3 represent research timeline for the proposed study representing the order of the main activities and the milestones of the study over time. The developed timeline will include a duration of 42 months, making sure that each of the stages of the implementation of such a research project takes place in a highly systematic, organized, and timely manner, making it easy to adapt to changes and solve eventual problems.

Figure 3: Research timeline

CONCLUSION

The BOHAT study holds huge potential for promoting oral health care through collaborative and interdisciplinary approaches. It will accomplish early diagnosis, timely referrals, and comprehensive care by integrating assessment actions for oral health into routine practices of non-dental primary health care professionals. This work is a large step toward the integration of oral health into general health care with the cementing of general health and well-being and the reduction of health disparities. This study can, therefore, serve as a model for similar efforts elsewhere in the world and help to ensure good oral health outcomes and excellent quality of life for diverse populations.

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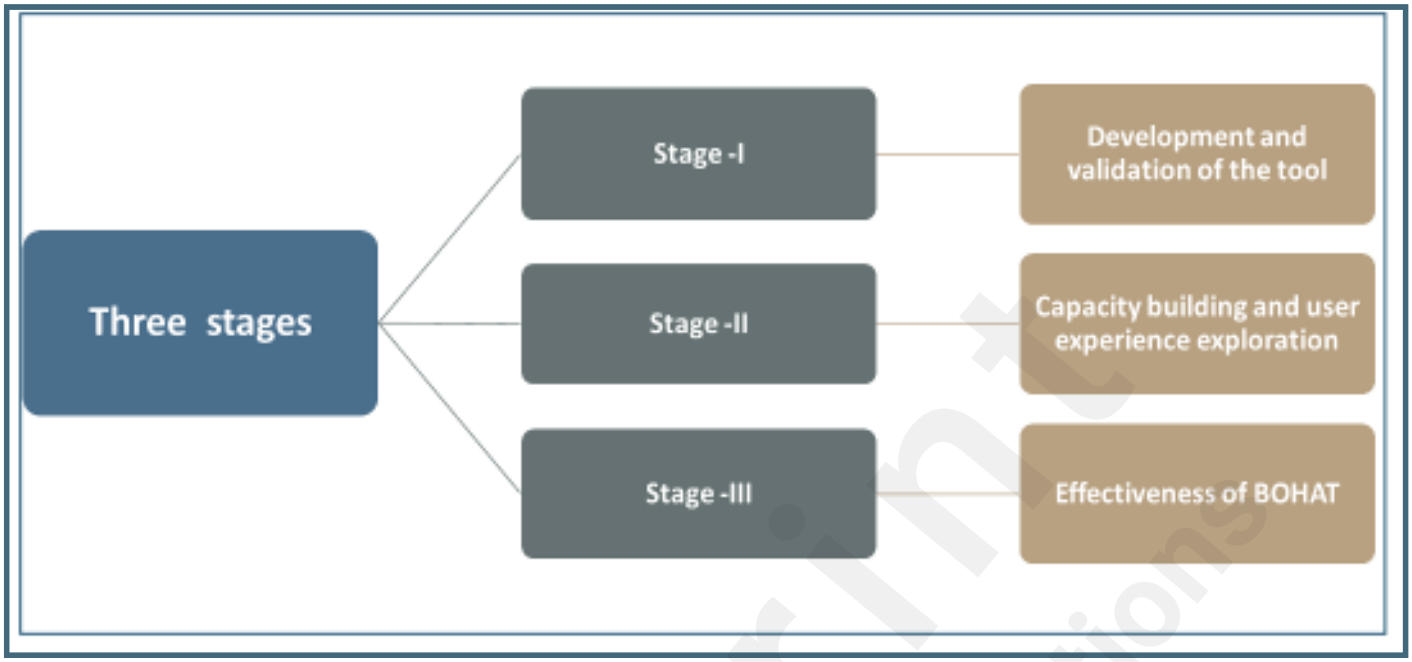
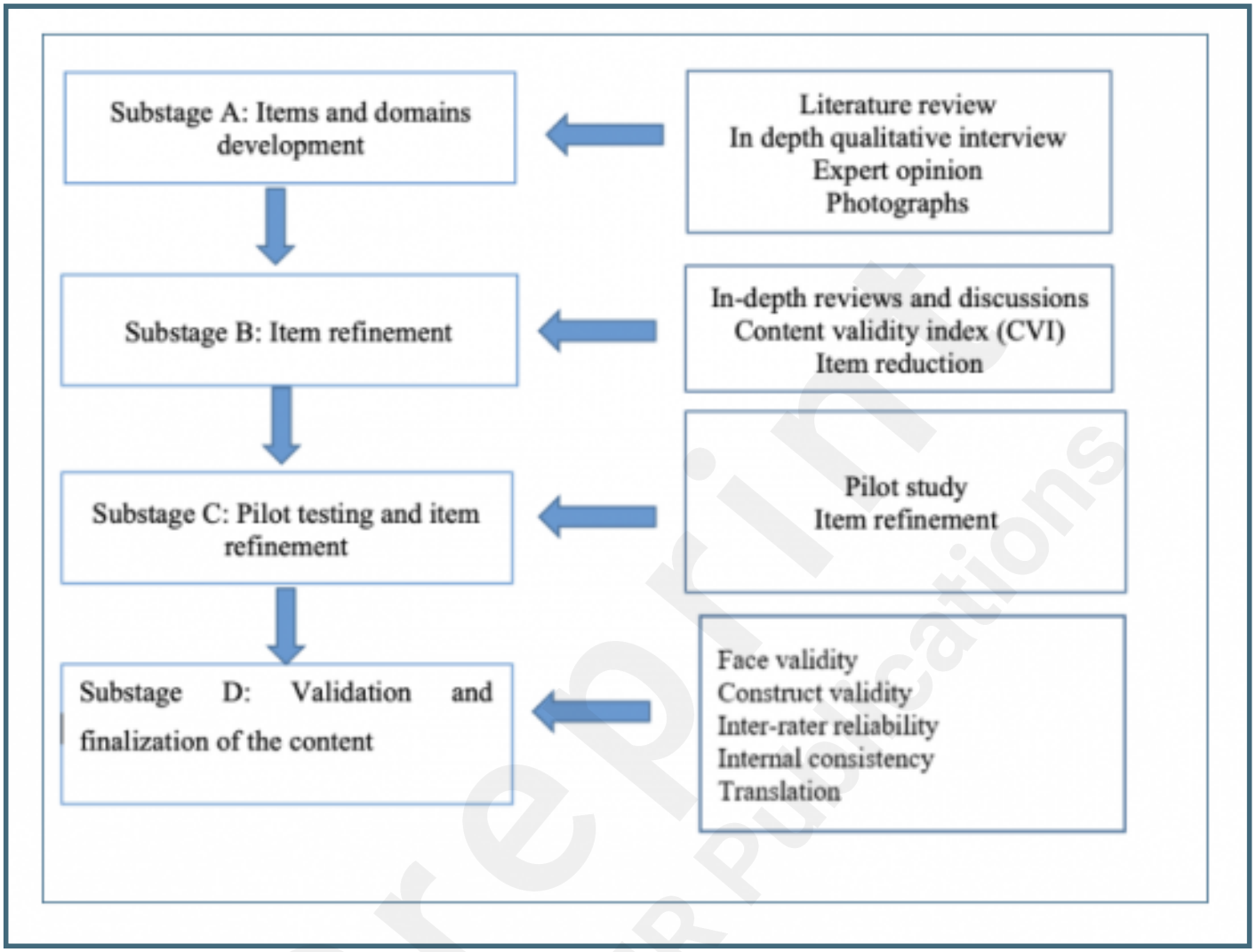
Supplementary Files

Figures

Multi stage of the study.



Conceptual framework for development and validation of BOHAT.



Research timeline.