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Development and Validation of an Information e-booklet to Promote Preventive Osteoporosis Measures in Indian Office Workers

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ABSTRACT: Osteoporosis is a significant public health concern in India, particularly among office workers who spend long hours sitting at their desks. Information e-booklets have been used as a health promotion tool to raise awareness about osteoporosis and its preventive measures. However, the content validity of these e-booklets has not been evaluated in the Indian context.

The main objective of this study was to develop and validate an osteoporosis information e-booklet designed to promote preventive measures for osteoporosis among Indian office workers.

A group of experts who specialize in osteoporosis reviewed the material presented in the e-booklet. Each element was assessed on a 3-point scale (1= agree, 2= disagree, 3= neutral), and the item content validity index (I-CVI) was computed for each component. The e-booklet underwent additional validation by fifteen office workers before finalizing the final version.

The I-CVI for the expert rating of the e-booklet ranged from 0.86 to 1, while for the target audiences (office workers), it was 0.80 to 1, indicating a high level of content validity. The kappa values ranged from 0.85 to 1.0. All items had a CVI and kappa of 0.80 or higher, indicating that the e-booklet had a high relevance, accuracy, clarity, and completeness. Valuable feedback from experts and the sample of readers was incorporated into the final iteration of the e- booklet. The study encountered challenges in obtaining reliable data on osteoporosis preventive measures among Indian office workers and designing an effective e-booklet that caters to the diverse educational backgrounds and technological literacy of the target population. However, despite these challenges, the study made significant contributions by creating a validated e-booklet with high content validity, which has the potential to raise awareness and encourage the adoption of preventive measures for osteoporosis among Indian office workers, addressing a critical knowledge gap and providing a valuable resource for promoting bone health in this population. The findings of this study highlight the importance of content validation in developing health promotion materials for specific populations, and the e-booklet can serve as a valuable tool for health promotion programs aimed at preventing osteoporosis among office workers in India.

Keywords: Osteoporosis, Bone health, office workers, Validation, booklet.

INTRODUCTION

Low bone density, fragility, and fracture risk make osteoporosis a significant public health issue (Melton *et al*., 1992). It affects 26.3 percent of women and 10.9 percent of males in India. (Sabat *et al.*, 2022) With aging populations and changing lifestyles, this condition affects millions worldwide. Another study found that osteoporosis increases cardiovascular risk, emphasizing the need to screen patients for cardiovascular disease (Lello *et al.,* 2015).

A sedentary lifestyle has become a major concern for Indian office workers due to the nature of their work which often involves prolonged sitting at a desk. A sedentary lifestyle is defined as a lifestyle with little or no physical activity and has been associated with numerous health problems, including obesity, diabetes, cardiovascular disease, and osteoporosis (Banerjee and Khatri *et al.*, 2010; Kaur *et al.*, 2012; Park *et al*., 2020; Prasad and Dasi *et al*., 2009; Rastogi *et al*., 2004; Singh and Purohit 2012).

Due to a sedentary lifestyle, office workers in India are at an elevated risk for osteoporosis; decreased physical

activity and muscle strength can lead to loss of bone density and an amplified risk of fractures due to prolonged sitting at a desk and limited exposure to sunlight, which can also lead to vitamin D deficiency (Booth *et al*., 2012; Kling *et al*., 2014; Lips and Van Schoor *et al.,* 2011; Prentice, 2004). The risk of osteoporosis in office workers can be reduced by promoting regular physical activity and encouraging frequent movement breaks throughout the day (Mathew *et al.,* 2019; Munshi *et al*., 2015; Shafieinia *et al*., 2016; Tan *et al*., 2013).

Information booklets can help reduce the risk of osteoporosis by providing information on risk factors, symptoms, management, and strategies, as well as encouraging preventive measures such as regular exercise, fall prevention, and calcium and vitamin D supplementation (Baz and Toraman *et al*., 2022; Crawford-Manning *et al*., 2021; Jeihooni *et al*., 2022; Linton *et al*., 2020; Lopez-Olivo *et al*. 2020; Momennasab *et al.,* 2017; Muñoz-garach, García-fontana and Muñoz-torres 2020; Varghese *et al.,* 2013). Despite the high prevalence of osteoporosis in India, there is low awareness and knowledge level (Panda *et al*., 2022 and Sabat *et al*., 2022).

To address this gap, a e-booklet is needed to educate and raise awareness among Indian office workers about osteoporosis, as no such booklet currently exists exclusively for office workers of both genders. Therefore, the main objective of the study is to develop an information booklet specifically for Indian office workers to promote osteoporosis prevention and management.

METHODOLOGY

This study developed educational material following literature recommendations and using a two-step process. The first step was to create an information booklet based on existing literature, while the second step involved validating the e-booklet using an online Delphi method with experts. The booklet's evaluation focused on content validity and its appearance, using a judgment-based instrument that measured the adequacy of assessment items and sought agreement between judges. The educational booklet was designed in accordance with suggestions for effective learning materials, taking into account elements such as content, language, structure, design, graphics, knowledge retention, and encouragement (Carolina *et al*., 2017; de Jesus *et al*., 2018; Demir *et al*., 2008; Garrett da Silva *et al*., 2017; Hoffmann and Worrall 2004; Hortense *et al*., 2018; Santiago and Moreira 2019; Sousa and Turrini 2012). This booklet was designed using Canva software(https://www.canva.com/). Ethical approval was obtained from the institution's ethical review board of Jayoti Vidyapeeth Women's University, Jaipur, India, and all participants signed the consent form.

A. Content generation

(i) Literature search. The first step in developing an osteoporosis booklet was to conduct a thorough literature review of existing literature related to osteoporosis. This review covered the definition, causes, risk factors, symptoms, diagnosis, and treatment options for osteoporosis, as well as information on lifestyle modifications that can prevent or slow the progression of osteoporosis. Relevant studies and research articles were found through electronic databases such as PubMed, Trip database, Cochrane Library, and Google Scholar.

(ii) Expert consultations and content development. Consultation with experts in the field of osteoporosis was crucial to ensure the accuracy and completeness of the information provided in the booklet as well as it was also important to ensure that the content was relevant and effective in promoting awareness and prevention of osteoporosis. Experts included physicians, nutritionists, physical therapists. These experts provided valuable insights into the most important information to include in the booklet and the most effective ways to communicate that information. Based on the information gathered from the literature review and consultation with experts, the content for the booklet was developed. The content was presented in a clear, concise, and easy-to-understand manner, with appropriate use of images and diagrams to illustrate key points. The content was organized logically, with sections devoted to risk factors, prevention, and treatment options.

B. Validation

The content validation process of an educational booklet refers to the process of evaluating the accuracy, completeness, and relevance of the content in the booklet to ensure that it meets the educational objectives and is appropriate for the intended audience (Adikari *et al*. 2019; De Matos Magalhães *et al.,* 2022). An expert committee received the preliminary version of the tool and provided inputs (Stone, 1993). A seven experts committee assessed the booklet title and objective, content, writing language, illustrations, layout, and general feature domains**.** Three physicians, two physiotherapists, and two nutritionists made up the committee.

The scale had 19 items. To determine the content validity index (CVI), each item was rated on a three-point scale, with a score of 1 representing agreement and scores of 2 and 3 representing disagreement and neutrality, respectively (1 = agree, 2 = disagree, 3 = Neutral). Only the items that received an agreement score of 1 were included in the calculation of the CVI to determine the CVI. (De Sabino *et al*., 2018; Hortense *et al*., 2018; Mantilla *et al*., 2012; Teles *et al*., 2014).

The selection criteria for experts involved having expertise in the healthcare domain that caters to patients with osteoporosis and a minimum of five years of experience in osteoporosis treatment in India. The experts were requested to carefully examine the booklet, answer the 19-item questionnaire, and provide suggestions in the recommendation section to improve and finalize the booklet. The authors collected the completed questionnaires and implemented the corrective recommendations. A questionnaire with close-ended questions was used as an instrument (Alexandre and Coluci 2011; Carvalho and Meirelles

2009; Silva *et al*., 2017; Sousa and Turrini 2012; Teles *et al*., 2014; Valéria De Freitas *et al*., 2011).

(i) Content validation (online Delphi method). This method employs the Item-Content Validity Index (I-CVI) to compute the CVI. The I-CVI is determined by dividing the number of experts rated an item as "extremely relevant" by the total number of experts. The resulting I-CVI score ranges from 0 to 1, and when working with six to eight experts, a minimum acceptable CVI score is typically 0.83 (Lynn, 1986; Yusoff, 2019).

Content's validity was carried out, and the CVI score was calculated accordingly. All seven of the agreed-upon experts were sent a mail, including a cover letter describing the justification for including them as well as instructions on how to evaluate and score each validation question (Faria, Teixeira-Salmela and Nadeau 2013a, 2013b; Gadotti, Vieira and Magee 2006; Grant and Davis 1997; Polit and Beck 2006; Polit *et al.,* 2007; Wynd *et al.,* 2003).

Table 1 and Table 2 list the content validity score and expert suggestions.

(iii) Kappa. Wynd *et al.* (2003) suggest that calculating a kappa value in addition to the CVI can be advantageous. This metric evaluates the level of agreement beyond what could be attributed to chance and can be computed using the following formula.

$K = (I\text{-}CVI - Pc)/ (1- Pc)$,

where $Pc = [N!/A!(N-A)!]* 0.5^N$ (Zamanzadeh *et al.,* 2015)

Pc= the probability of chance agreement;

N = a number of experts, and A= experts mentioning relevant items.

Kappa values are typically evaluated using a specific scale, as recommended by convention. Ratings between 0.40 and 0.59 are considered fair, those between 0.60 and 0.74 are considered good, and values above 0.74 are deemed excellent (Cicchetti and Sparrow 1981; Zamanzadeh *et al*., 2015).

Statistical Analysis. A Content Validity Index was used to statistically examine the produced instrument's content validity. The Kappa-modified coefficient determined the CVI's level of the relevant agreement (Polit *et al.,* 2007; Zamanzadeh *et al*., 2015).

Face Validity. Following expert recommendations, we made the necessary corrections to the booklet and subsequently submitted it for face validity assessment. To determine the validity (face and content) of the booklet based on the viewpoint of the intended audience, a convenience sampling method was utilized to choose 15 office workers. The selected individuals were asked to complete the same 19-item tool to provide back feedback on the relevance and appropriateness of the booklet's content. No significant feedback was received, except for the font size and medical terminology modification, which were modified in the final version. Tables 1 and 3 include details about content validity and feedback scores provided by the target group. Table 1 and Table 3 list the content validity score of targeted audiences and their feedbacks.

Table 1.

EXPERT			AUDIENCE
TITLE AND OBJECTIVE			
	I-CVI	**KAPPA**	**I-CVI**
1. The booklet's title is perfectly acceptable.	0.86	0.85	0.94
2. The booklet's objective is well-defined.	0.86	0.85	0.80
CONTENT			
3. Suitable for the intended audience.	0.86	0.85	1
4. Give enough details.	0.86	0.85	0.94
5. Sequentially arranged	1	1	0.94
6. It includes recent information.	0.86	0.85	0.86
7. Encourages the reader to keep reading.	0.86	0.85	0.86
WRITING LANGUAGE			
8. The language is straightforward and clear.	0.86	0.85	0.80
9. It's simple to comprehend	1	1	1
ILLUSTRATIONS			
10. Relevant to the material's content and helps to clarify it.	1	1	0.94
11. The amount is appropriate for the educational content.	0.86	0.85	1
LAYOUT			
12. The text has been coloured in a way that is both appropriate and easy to read.	0.86	0.85	0.86
13. The visual design is appealing and well-organized.	0.86	0.85	1
14. The educational material's format (size) and page count are adequate.	0.86	0.85	1
15. The layout of the content is sufficient.	0.86	0.85	1
16. The titles, subtitles, and text font sizes are suitable.	0.86	0.85	0.86
GENERAL FEATURE			
17. Encourages learning	0.86	0.85	1
18. This book has a lot of useful information in it.	0.86	0.85	0.93
19. Basic concept is clear.	1	1	0.93

Table 2: Overall suggestions received by Judges.

• The primary focus of this booklet relates to Indian office workers. Therefore, it is recommended to incorporate additional remedies that are relevant to the Indian context.
• Summarize the material and reduce the total number of pages.
• Try to address more common myths and misconceptions about osteoporosis.
• Use more figures and diagrams to make the content more attractive and presentable.
• One possible revision: "To enhance readability, it is recommended to enlarge the font size throughout the document."
• Add hyperlinks for references and further reading links.
• Ensure that all facts have references and use recent national recommendations for nutrients.
• Correct spelling errors.

Table 3: Target populations' feedbacks.

• The material offered in the e-booklet was simple to understand for me. It was written in simple language with relevant examples.
• I found the part about working out and eating to be very helpful. It gave useful advice on how to fit these things into a busy work schedule.
• The design of the e-booklet was looked great and easy to be using.

RESULT

In the initial content validation phase with the expert, the items were rated using the CVI scale, which ranged between 0.86 to 1, with a kappa score of 0.85. Additionally, minor typographical errors were identified and corrected based on feedback received. For the title and objective, the content validity and kappa score were acceptable, with scores ranging from 0.86 to 0.85 for both. In the content domain, the overall quality was evaluated, with the lowest CVI score being 0.86 and the highest being 1, with a kappa score ranging from 0.85 to 1.Similarly, for the writing language and illustrations, the CVI scores ranged from 0.86 to 1, with a kappa score of 0.85 to 1. The layout received a CVI score of 0.86 and a kappa score of 0.85. The I-CVI score from the target population varied from 0.80- 1. Overall, the general features also had acceptable CVI scores, ranging from 0.80 to 1, with a kappa score of 0.85 to 1. For the booklet, I- CVI ranges from 0.80 to 1.

These results indicate that the content validation phase was successful, and the identified minor errors were addressed.

Limitation. A noteworthy limitation of the present study is its relatively modest sample size. To improve the generalizability of findings, future research could consider utilizing larger sample sizes.

DISCUSSION

Educational materials are an efficient tool to support the health teaching and learning process, leading to enhanced autonomy of both the target audience and professionals working with them. This, in turn, can result in better decision-making and conduct toward preventive measures (Alexandre and Coluci 2011; Carolina *et al*., 2017; Mantilla *et al.,* 2012; Teles *et al.,* 2014).

Several booklets have been previously reported in the Indian context, predominantly in print (D'Silva and Pinto, 2017; Jospin Nisha, 2018; Khatoon, 2013; Sachan *et al*., 2016; Shilpa and D'Souza, 2020; Varghese *et al*., 2013). However, no electronic book has been developed specifically for Indian office workers addressing preventive measures for osteoporosis. Hence, this e-book is believed to be the first of its kind, aimed at disseminating information on osteoporosis prevention among Indian office workers.

E-booklets have been found to be effective in improving knowledge and attitudes in various fields, including health-risk behaviors among high school teachers (Momennasab *et al*., 2018), drug regimen education for living-donor renal transplant recipients (Schmid *et al*., 2017), traditional medicine knowledge among the public (Dewi *et al*., 2022), self-regulated learning for students (Sucipto *et al*., 2022), sibling rivalry education for parents (Cantika Brilliana *et al.,* 2022) and food security based on science literacy for students (Amalia *et al*., 2022). E-booklets are practical, efficient, easily distributed via the internet, and can increase student activity. While e-learning may be more effective in improving knowledge, e-booklets can be a suitable alternative for different learners and outperform visual media such as posters in improving knowledge, attitudes, and behavior (Cantika Brilliana *et al*., 2022).

The e-booklet was designed to provide guidance on preventive measures that can be taken by office workers to reduce their risk of developing osteoporosis. The e-booklet was designed for utilization by healthcare and education experts in association with office workers, along with the office workers themselves. The quality of the booklet was ensured via content validation conducted by professionals having expertise in the relevant domain utilizing the online Delphi technique. The main objective of this technique was to determine the comprehension of the items and their relevance to the validated attribute. Additionally, the specialists were requested to suggest improvements for the e-booklet, which were subsequently integrated into the final version.

The content validation process resulted in several suggestions from the judges for improving the e-booklet. In response to these suggestions, adjustments were made to the illustrations and images to ensure that they were informative, easy to comprehend, and directly connected to the written content. The critical analysis of the e-booklet was essential to improve the material and make it more suitable for the target audiences.

FUTURE SCOPE

In the future, research could focus on evaluating the impact of the e-booklet on actual behavioural changes related to osteoporosis prevention measures among Indian office workers, through longitudinal studies with larger sample sizes. Additionally, incorporating culturally-tailored content and strategies in the e-booklet could enhance its relevance and effectiveness in the Indian context. Qualitative research could be conducted to explore perceptions, barriers, and facilitators to adopting preventive measures for osteoporosis, informing future iterations of the e-booklet and health promotion strategies.

The study could explore the feasibility of incorporating interactive features, such as multimedia elements, quizzes, and personalized feedback, in the e-booklet to enhance its engagement and effectiveness. Future research could also investigate the long-term impact of the e-booklet on osteoporosis prevention behaviours and outcomes among Indian office workers, using follow-up assessments. Collaboration with stakeholders such as healthcare providers, employers, and policymakers could be explored to integrate the e-booklet into workplace wellness programs or policy initiatives aimed at promoting bone health in the office worker population in India.

CONCLUSIONS

In conclusion, the validation of the e-booklet has shown that it is a highly valid and effective tool in promoting preventive measures for osteoporosis among Indian office workers. The e-booklet can be used by health professionals to educate their patients about osteoporosis prevention, and it can also be distributed to the public to increase awareness of the condition and its preventive measures.

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Conflict of Interest. None.

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