

Development and Validation of Eating Disorder Screening App for Population of Pakistan

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ABSTRACT

Background and Objective: Eating disorders are categorized by unbalanced eating habits and severe distress or apprehension about shape or body weight. They create a significant impact on the physical, psychological and social health of the individuals. The main aim of the present study was to develop and validate a user-friendly eating disorder screening mobile application for the Pakistani population.

Materials and Methods: A randomized, pre-post intervention, controlled, single-blinded study design was used. A prototype app was developed for screening with different tools. After the screening, respondents in the intervention group were requested to view the awareness videos embedded in the app along with special counselling provided by the data collectors whereas those in the control group were not given access to these features of the app and also did not receive any counselling. After data collection, data were analyzed by using SPSS statistically. **Results:** The results of the study highlighted that 46% (n = 92) of the respondents had the probability of having an eating disorder. A significant difference ($p \leq 0.05$) was observed among the control and intervention groups. The intervention was found successful as chances of detection of eating disorders increased with awareness and negative beliefs regarding eating disorders decreased in the intervention group. **Conclusion:** The results of the present study highlighted a moderate prevalence of eating disorders in the Pakistani population. The app was found useful in screening and promoting awareness regarding eating disorders and decreasing negative beliefs attached to social taboos about eating disorders.

KEYWORDS

Eating disorders, awareness, counselling, screening, prevalence, health mobile app, Pakistan

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INTRODUCTION

The deployment of smartphones and tablets by the medical field to offer versatility in clinical settings has increased with rapid advancements in mobile technology. Today mobile apps are being used in different domains of practice, for clinical reference, for improving workflow in healthcare facilities, health education, communication, patient engagement with healthcare professionals and health awareness programs¹. A targeted and focused approach towards the usability of the app along with motivational features and social and cultural norms lead to successful considerations². Another study conducted in Australia highlighted that an evidence-based, focused patient-centered weight management program through the use of an app can be implemented in pharmacies to achieve targeted results³. Smartphone apps may be



an advanced medium for delivering individual health behavior change intervention in large populations⁴. The increased prevalence of the use of mobile phones and other electronic equipment has not only changed the lifestyle of individuals but has also affected the dynamics of the health care system. Today validated, reliable, cost-effective and user-friendly mobile healthcare applications are widely accepted by healthcare officials, organizations and patients all over the world. A review of eating disorder treatment apps conducted in USA concluded that mobile health tools showed feasible modalities for delivering health-based services and interventions to the public. A review of smartphone applications for eating disorders reported that the feasibility, acceptability and efficacy of apps should be evaluated for the provision of better healthcare services⁵.

Pakistan ranks in 9th position out of 188 countries in terms of obesity. Lack of screening programs, inadequate standard practices low knowledge of guidelines regarding eating disorders are not only delaying the diagnosis but are also compromising the health-related quality of life of the people. Moderate binge eating disorder was reported in obese individuals in Pakistan but still in most of the cases it goes undiagnosed. Students and non-smokers were found more prone to Binge Eating Disorder but early detection through effective screening programs and evidence-based treatment strategies would help the patients to recover in the initial stages in order to prevent further complications⁶. Eating disorder is the biggest social taboo that needs to be addressed in Pakistan. Unfortunately, data on eating disorders in Pakistan is scarce due to limited research conducted from this perspective. To decrease prevalence of eating disorders in Pakistan, screening has become inevitable. To do so, a patient centered outcome-oriented screening health app can assist in better diagnosis and provide logistic support to the healthcare providers of the country. Therefore, the current research was designed to develop and validate an eating disorders screening app for Pakistani population.

MATERIALS AND METHODS

Study area: This study was conducted in twin cities of Pakistan i.e., Islamabad and Rawalpindi for 1 year i.e., January to December, 2022.

Study design and sampling technique: A randomized, controlled, single-blinded, pre-post study design was used. Approval to conduct the current research was obtained from the Ethical Committee of Hamdard University (Ref. No. HU/ERC/2022/090). A total of 200 respondents willing to participate in the study were selected using convenience sampling technique. Simple random sampling technique was used to assign respondent to be included in group A (Control) and group B (Intervention). A hundred respondents were assigned to each group using WHO sample size criteria for intervention. Respondents included in group B were only targeted for training through awareness videos while no training was given to respondents in group A (control). Data was collected from respondents by administering the questionnaires through app.

Inclusion and exclusion criteria: The inclusion criteria for this study were individuals of both genders having smartphone who were able to download and operate the app. Individuals 18 years of age or more and having at least a primary qualification that can read and follow instructions were chosen for the study as respondents. Individuals without possession of smartphone with the ability to download and run the study app, refusal to participate, or currently diagnosed/treated for any major eating disorder were excluded.

Data collection tools: Pre-validated data collection tools were embedded in the app. Eating Disorders Diagnostic Scale questionnaire⁷ was used for screening of eating disorders. The questionnaire is comprised of twenty-two questions designed to measure eating disorders like binge eating disorder, anorexia nervosa and bulimia nervosa. This self-reported questionnaire is comprised of a combination Likert scale along with dichotomous scores, behavioral-frequency scores and open-ended questions related to weight and height.

The belief of respondents was checked using Eating Disorder Belief questionnaire⁸. The tool consists of thirty-two questions which were divided into four categories to evaluate negative self-belief, acceptance by others, self-acceptance and belief regarding control of overeating. A scoring range of 0 to 100 was provided to the respondent where 100 means the strongest belief one can imagine.

The feedback of respondents was evaluated using mHealth App Usability questionnaire also known as MAUQ⁹. The tool consisted of twenty-one questions regarding usefulness, ease of use satisfaction and system information arrangement. In this questionnaire the score for strongly disagree is 1, disagree is 2, somewhat disagree is 3, neither agree nor disagree is 4, somewhat agree is 5, agree is 6 and the score for strongly agree is 7. Therefore, to determine the usability of the app a total score is calculated and the average of the responses is taken. The higher the overall average means the higher the usability of the app.

Designing and implementation of intervention

Development of training material: The focus, targets, content format of interventions were designed after a series of discussions with stake holders including public health experts, clinical psychologists, physicians, pharmacists and psychiatrists. The content of training material was developed from the World health organization¹⁰, Diagnostic and Statistical Manual of Mental Disorders (DSM-5)¹¹. The name of the training material was recommended to be community eating disorder initiative.

General description of training: The training focused on implementation of intervention model based on three levels.

- **Level one**

Training of screening tools: The goal of this level was to train data collectors for each screening tool to provide background on that tool, basic organization and framework of the tool to discuss how the results can be interpreted. The goal of this training was to train them to identify eating disorder symptoms, quality of life and patient belief along with answer queries from respondents

- **Level two**

Screening and assessment: The goal of this level was to train data collectors in the early detection of risk factors leading to eating disorders. It involved training on implementation of eating disorder awareness videos, their types, myths and facts, risks and concerns and how to screen eating disorders

- **Level three**

Management of common eating disorders: The goal of this level was to train about tools and strategies used for navigating and managing an eating disorder screening diagnosis by improving awareness. The data collectors were trained for provision of counseling respondents

Training aid

Development of app: A mobile app development software platform Appy Pie app builder version 2.0 with a minimum amount of coding was used for development of the app. The software was entirely cloud-based and required no installation. Steps included in development were entering the business name, choosing the specific app category, picking a color scheme, selecting the device to test mobile app and adding in the required features. Appy Pie provided a navigation feature to give step by step directions for development. The paid version of Appy Pie was used to support Android. The drag-and-drop interface was used.

Design of app: Prototype content was designed to be representative of a generic self-monitoring tool, on which respondent monitored their mood, stressors and coping strategies on a day-to-day basis. App

was bilingual in English and Urdu. Graphics and a light purple color theme were included to enhance the prototype visual appeal and the prototype was given the name of Community Eating Disorders Initiative Aid (CEDI Aid).

- **Sign up:** At the onset of the CEDI Aid user consent form was available for completion and sign up option to start a session
- **Home page:** The page provided a simple and visual portrayal of the Menu to access all other pages. The page included About us, Introduction, Global statistics, Awareness videos, Let Break the Stigma, Check your eating disorder, Feedback, Shareapp and Contact us
- **About us:** The page informed the respondent about the founder, advisor and researchers of CEDI Aid. This page provided insight of mission and vision
- **Introduction:** The page provided brief explanation of eating disorders, their types, etiology, sign and symptoms
- **Global statistics:** The page provided brief explanation of eating disorders facts and figures
- **Awareness videos:** The page included awareness videos on eating disorders, types, sign and symptoms, risks and concerns, myths and facts, management of eating disorders and how to screen them. Videos were bilingual in English and Urdu
- **Let's break the stigma:** The page included videos on let's break the eating disorders stigma together and stop body shaming. Videos were bilingual in English and Urdu
- **Check your eating disorder:** Different tools were available for completion in quiz, providing baseline measures of eating disorders and different variables. Survey "blocks" consisted of questions which were shown on the home screen until their completion
- **Result:** A summary of general score along with color coded brief description and emoticon showing the possibility of an eating disorder on that day was provided to respondents after they had completed the quiz
- **Feedback:** The page included a Feedback quiz, that how likely the respondent will rate the CEDI Aid and recommend this app to a friend or family member
- **Share app:** The page allowed the respondent to share CEDI Aid from one device to another through WhatsApp and Facebook

Launching of app: The beta version link of CEDI Aid app was sent to intervention group through Email, Facebook or WhatsApp.

Pre and post training data collection: All the respondents of both control and intervention groups downloaded the app and used the embedded tools for screening of any eating disorder issue. However, all other features of the app were blocked for the respondents in the control group and they could only view the basic features. After screening, respondents in the intervention group were requested to view the awareness videos embedded in the app along with special counseling provided by the data collectors whereas those in the control group were not given access to these features of the app and also did not receive any counseling. The respondents of the intervention group received counseling about disease, its complications, lifestyle modification and self-monitoring of the eating disorder through awareness videos already available in app. Moreover, the respondents in intervention group were also counseled through telemonitoring during the course of the study by the data collectors.

Data collection procedure and statistical analysis: Data was collected using the data collection tools at the baseline and after 2 months from respondents both from the control and intervention groups. After data collection data was cleaned coded and entered in SPSS version 22 and statistically analyzed. Descriptive statistics comprising of frequency and percentages were calculated. Wilcoxon Rank Test ($p \geq 0.05$) was used to find the pre-post differences among both groups.

RESULTS

Out of 200 respondents, 64% (n = 128) were males and 36% (n = 72) were females. Most of the respondents were in the age group 26 to 35 years (50%, n = 100). Regarding qualification, 43% (n = 86) had bachelor's degree while 18% (n = 36) had master's degree. Of the total respondents, 44% (n = 88) were healthcare professionals followed by 20% (n = 40) were students. Nearly, 13% (n = 26) belonged to rural areas and 87% (n = 174) were urban resident. Out of 200 respondents screened for eating disorders using the app revealed that 46% (n = 92) people had the probability of having an eating disorder (Table 1).

A significant difference ($p \leq 0.05$) was observed among the control and intervention groups. The intervention was found successful as chances of detection of eating disorders increased with awareness and negative beliefs regarding eating disorders decreased in the intervention group (Table 2).

The results of the feedback form filled by the post-intervention group regarding the eating disorder screening app highlighted that majority of the respondents strongly agreed with different features of the app were: Easy to use (72%, n = 144), easy to learn to use the app (20%, n = 40), satisfied with this app (17.0%, n = 68), information was well organized (14.0%, n = 56), navigation was consistent when moving between screens (10.0% n = 40) and interface of the app allowed to use all the functions (29.0%, n = 116). Almost 32% (n = 128) found the app useful for health and well-while 13% (n = 52) stated that the app helped to manage health effectively (Table 3).

Table 1: Demographic characteristics of the respondents

Indicators	n (%)		Indicators	n (%)	
Gender	Male	128 (64.0)	Profession	Healthcare professionals	88 (44.0)
	Female	72 (36.0)		Student	40 (20.0)
				Others	72 (36.0)
Age	18 to 25	76 (38.0)	Occupational status	Unemployed	20 (10.0)
	26 to 35	100 (50.0)		Employed	134 (67.0)
	36 to 45	12 (6.0)		Student	40 (20.0)
	46 to 55	12 (6.0)		Retired	6 (3.0)
Marital status	Single	126 (63.0)	Residence	Urban	174 (87.0)
	Married	72 (36.0)		Rural	26 (13.0)
	Others	2 (1.0)			
Education	Primary	14 (7.0)	Income	≤Rs 18,000	66 (33.0)
	Matric	8 (4.0)		Rs 18,000-50,000	68 (34.0)
	High secondary school	14 (7.0)		Rs 50,000-100,000	52 (36.0)
	Bachelors	86 (43.0)		Rs 100,000 above	14 (7.0)
	Mphil	38 (19.0)			
	Masters	36 (18.0)			
	PhD	4 (2.0)			
Screening for eating disorder	No eating disorder	108 (54.0)			
	Probability of eating disorder	92 (46.0)			

Table 2: Assessment of the impact of intervention using Health

Group	n	Mean rank	Test statistic	p-value
EDDS	pre-control = 100	84.78	119.89	0.001
	post-control = 100	83.52		
	Pre-intervention = 100	114.46		
	Post-intervention = 100	119.24		
EDBQ	pre-control = 100	112.70	40.028	0.001
	post-control = 100	114.60		
	Pre-intervention = 100	108.31		
	Post-intervention = 100	54.15		

Wilcoxon rank test ($p \geq 0.05$), EDDS: Eating disorders diagnostic scale and EDBQ: Eating disorders belief questionnaire

Table 3: Assessment of user feedback regarding eating disorder screening app

Indicator	Feedback	n (%)
App was easy to use	Strongly disagree	0
	Disagree	0
	Somewhat disagree	2 (1)
	Neither agree nor disagree	0
	Somewhat agree	2 (1)
	Agree	52 (26)
	Strongly agree	144 (72)
It was easy for me to learn to use the app	Strongly disagree	4 (2)
	Disagree	0
	Somewhat disagree	4 (2)
	Neither agree nor disagree	4 (2)
	Somewhat agree	16 (8)
	Agree	132 (66)
	Strongly agree	40 (20)
I like the interface of the app	Strongly disagree	0
	Disagree	0
	Somewhat disagree	8 (4)
	Neither agree nor disagree	8 (4)
	Somewhat agree	8 (4)
	Agree	104 (52)
	Strongly agree	72 (36)
Information on the app was well organized, so I could easily find the information I needed	Strongly disagree	4 (2)
	Disagree	4 (2)
	Somewhat disagree	0
	Neither agree nor disagree	12 (6)
	Somewhat agree	8 (4)
	Agree	24 (12)
	Strongly agree	108 (54)
I feel comfortable using this app in a social setting	Strongly disagree	8 (4)
	Disagree	4 (2)
	Somewhat disagree	0
	Neither agree nor disagree	8 (4)
	Somewhat agree	16 (8)
	Agree	120 (60)
	Strongly agree	44 (22)
Amount of time involved in using this app has been fitting for me	Strongly disagree	4 (2)
	Disagree	8 (4)
	Somewhat disagree	0
	Neither agree nor disagree	0
	Somewhat agree	8 (4)
	Agree	120 (60)
	Strongly agree	44 (22)

DISCUSSION

Mental health conditions especially eating disorders are the most neglected public health issues. With the increasing prevalence of obesity and eating disorders, the risks of associated comorbidities have also increased. These health conditions are not only responsible for impaired quality of life but also contribute towards high treatment costs. The problems developing countries face in addressing these eating disorders include a lack of awareness and limited screening services. Therefore, it is the need of the hour to produce cost effective and efficient, health awareness and screening programs that can help to reduce the burden of disease. The results of current study reported that the prevalence of eating disorders among the Pakistani population was moderate. These results were consistent with a study conducted in Sweden where the Eating Disorders Diagnostic Scale (EDDS) was considered to be a useful tool and a higher prevalence of eating disorders was reported^{7,12}. The concept of digital health has transformed the healthcare system in terms of the provision of better services. With the increased use of information technology, the healthcare system has been transformed into a delivery model of more patient-oriented

services. To decrease the burden of disease and promote awareness among the community mobile health apps have been proven to be not only successful interventions for better screening services but also for successful management of diseases. The present study was designed to make a mobile health app for screening eating disorders and providing information and awareness to public regarding the social taboo of eating disorders. Awareness videos seen by respondents of post intervention group changed their beliefs about eating disorders and information was successfully provided to them. The app helped to increase the likelihood of detection of eating disorders by increasing awareness and decreasing negative belief regarding eating disorders. These study results were consistent with a study which reported that Twazon Arabic app showed that waist circumference ratio, body weight were reduced and energy intake was improved with the help of the app. The study concluded that mobile health interventions can be effective for better healthy lifestyle modifications¹³. The results of the current study reported that the feedback of the app was taken through a mobile app usability questionnaire (MAUQ). The majority of the respondents agreed that the app was easy to use and users were satisfied with this app. They liked the interface of app and stated that information was well organized. They stated that the app was useful for health and well-being and helped to manage health effectively. The results of present study were comparable to a study conducted for promotion of eye donation through a mobile app, where participants were satisfied with the content and functionality of the app and gave the feedback that app was well-organized and user-friendly^{4,14}.

Financial constraints, lack of time and availability of limited literature on the topic were major limitations of the study. Being the first prototype of its kind developed and validated for screening of eating disorders, literature available was not sufficient to study the national data about eating disorders in Pakistan. Moreover, because of limited sample size of 100 results cannot be generalized for the entire population of Pakistan.

CONCLUSION AND RECOMMENDATION

The result of the present study concluded moderate prevalence of eating disorders and obesity in Pakistani population. The app was found useful in screening and promoting awareness regarding eating disorders and decreasing negative belief attached to social taboo about eating disorders. Therefore, massive awareness campaigns must be launched to aware community of the importance of early diagnosis and screening. Different versions of apps should be launched to be used in Android as well as IOS versions to increase their use along with voice modules which will increase the interest of the community in Health.

SIGNIFICANCE STATEMENT

An eating disorder is the biggest social taboo that must be addressed in Pakistan. Unfortunately, data on eating disorders in Pakistan is scarce due to limited research in this perspective. To decrease the prevalence of eating disorders in Pakistan, screening has become inevitable. To do so, a patient-centered outcome-oriented screening health app can assist in better diagnosis and provide logistic support to the healthcare providers of the country. Therefore, the current research was designed to develop and validate an eating disorders screening app for the Pakistani population. The developed app was found useful in screening and promoting awareness regarding eating disorders and decreasing negative beliefs attached to social taboos about eating disorders.

REFERENCES

1. Aungst, T.D., A.C. Miranda and E.S. Serag-Bolos, 2015. How mobile devices are changing pharmacy practice. *Am. J. Health-Syst. Pharm.*, 72: 494-500.
2. Alturki, R. and V. Gay, 2019. The development of an Arabic weight-loss app akser waznk: Qualitative results. *JMIR Form Res.*, Vol. 3. 10.2196/11785.

3. Um, I.S., I. Krass, C. Armour, T. Gill and B.B. Chaar, 2015. Developing and testing evidence-based weight management in Australian pharmacies: A healthier life program. *Int. J. Clin. Pharm.*, 37: 822-833.
4. Hebden, L., A. Cook, H.P. van der Ploeg and M. Allman-Farinelli, 2012. Development of smartphone applications for nutrition and physical activity behavior change. *JMIR Res. Protoc.*, Vol. 1. 10.2196/resprot.2205.
5. Juarascio, A.S., S.M. Manasse, S.P. Goldstein, E.M. Forman and M.L. Butryn, 2015. Review of smartphone applications for the treatment of eating disorders. *Eur. Eat. Disord. Rev.*, 23: 1-11.
6. Malik, M., W. Shaukat and A. Hussain, 2019. Binge eating disorder among obese/overweight in Pakistan: Under-diagnosed, undertreated and misunderstood. *Clin. Invest.*, 9: 75-80.
7. Stice, E., C.F. Telch and S.L. Rizvi, 2000. Development and validation of the eating disorder diagnostic scale: A brief self-report measure of anorexia, bulimia, and binge-eating disorder. *Psychol. Assess.*, 12: 123-131.
8. Cooper, M., E. Cohen-Tovée, G. Todd, A. Wells and M. Tovée, 1997. The eating disorder belief questionnaire: Preliminary development. *Behav. Res. Ther.*, 35: 381-388.
9. Zhou, L., J. Bao, I.M.A. Setiawan, A. Saptono and B. Parmanto, 2019. The mHealth app usability questionnaire (MAUQ): Development and validation study. *JMIR Mhealth Uhealth*, Vol. 7. 10.2196/11500.
10. WHO, 2013. Investing in Mental Health: Evidence for Action. World Health Organization, Geneva, Switzerland, ISBN: 9789241564618, Pages: 32.
11. APA., 2013. Diagnostic and Statistical Manual of Mental Disorders (DSM-5®). 5th Edn., American Psychiatric Association (APA), Arlington, VA, USA, ISBN-13: 9780890425572, Pages: 991.
12. Krabbenborg, M.A.M., U.N. Danner, J.K. Larsen, N. van der Veer and A.A. van Elburg *et al.*, 2012. The eating disorder diagnostic scale: Psychometric features within a clinical population and a cut-off point to differentiate clinical patients from healthy controls. *Eur. Eating Disord. Rev.*, 20: 315-320.
13. Alnasser, A., J. Kyle, N. Aloumi, A. Al-Khalifa and D. Marais, 2019. The Twazon Arabic weight loss app: App-based intervention for Saudi Women with obesity. *JMIR Mhealth Uhealth*, Vol. 7. 10.2196/10923.
14. Chumkasian, W., R. Fernandez, K.T. Win, C. Petsoglou and H. Lord, 2021. Adaptation of the MAUQ and usability evaluation of a mobile phone-based system to promote eye donation. *Int. J. Med. Inf.*, Vol. 151. 10.1016/j.ijmedinf.2021.104462.