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**Early Feasibility of Telemedicine-based Mental Health Wellbeing Centers: An implementation study in district and sub-district health facilities in Bangladesh**

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## Abstract

**Background:** Mental health disorders pose a critical burden globally, 400 million incident and 1.1 billion prevalent cases; and in Bangladesh, 10.38 million incident and 24.05 million prevalent cases in 2023. Despite the mental health burden in Bangladesh, the majority of the people (>90%) do not receive required services, due to the concentration of service providers in big cities, leaving rural and marginalized people disproportionately affected. Therefore, to address these barriers, the Non-Communicable Disease Control (NCDC) programme established tele-mental health services in government facilitated Wellbeing Centers at district and sub-district level. Thus, our study aimed to assess early implementation outcomes of the Wellbeing Center model.

**Methods:** The Wellbeing Centers implementation model was established in January 2023 in two district and five sub-district level hospitals to provide mental health services. We measured WHO's implementation research outcomes comparing with preset benchmark. Data were collected using a structured questionnaire from healthcare providers (n=167) and service recipient (n=7825).

**Results:** The findings revealed that the majority of the service providers perceived (96.4%, 95% CI: 92.3-98.6) the Wellbeing Centers fit well with the existing infrastructure of their facility. Whereas, half of the service providers (49.7%, 95% CI: 41.8-57.5) highlighted the shortages of staff in implementation. Besides, 99.8% (95% CI: 99.6-99.8) of user participants perceived that the WBC improved their access to mental health services, mental health services from WBC were acceptable (99.8%, 95% CI: 99.6-

99.8), and the WBC was useful (99.9%, 95% CI: 99.7-99.9). Moreover, high prevalence of moderate to severe anxiety (85.1%, 95% CI: 84.1-85.8) and depression (84.3%, 95% CI: 83.4-85.1) highlights a clear requirement for mental health care among participants. Multiple logistic regression identified several determinants of accessibility (high income group had 24% higher access), acceptability (unmarried had 35% lower acceptability), and usefulness (people aged higher than 50 years had 22% lower usefulness) of the Wellbeing Centers.

**Conclusion:** This implementation study indicated high initial service uptake, feasibility, accessibility, acceptability, usefulness of Wellbeing Center in addressing mental health challenges in low-resource settings like Bangladesh. Acknowledging human resource shortages, retention barriers, staff training, and infrastructural resilience will be required to scaling up the intervention.

**Keywords:** Tele-mental, implementation research, Mental health services, Health care accessibility, Feasibility studies, Bangladesh.

## **Background**

Mental Health (MH) illnesses are among the emergent causes of the global health-related burden that rising dramatically afterwards the COVID-19 pandemic both nationally and globally (1-3). Incident cases of mental disorders numbered 400.41 million worldwide in 2023, while prevalent cases reached 1,171.63 million (4). Since the 1990 disability adjusted life years (DALYs) attributable to mental disorders have more than doubled (104.79% increased), rising to over 171 million globally in 2023, placing mental disorders among the top five causes of DALYs globally (4, 5). In Bangladesh, incident and prevalent cases were 10.38 million and 24.05 million, respectively, with 3.80 million DALYs in 2023 (a 133.27% rise since 1990), also ranking among the top five causes of DALYs nationally (4, 5). Depressive and anxiety disorders alone contributed 56.02 million and 55.36 million DALYs worldwide, and 1.63 million and 1.02 million DALYs in Bangladesh, respectively, in 2023 (4). Thus, various mental health problems have been acknowledged as a consequential issue in low-income countries including Bangladesh (6), where National Mental Health Survey 2018-19 showed around 20 million people suffered from different types of mental disorders. Among them, 18.7% of adults (1 in 5) and 12.6% of

children (1 in 8) undergo from any form of mental illness specifically Depression (6.7%), Anxiety (4.7%) and Neurodevelopmental disorders (5.1%) (7). Rising prevalence of miscellaneous adverse mental effects and psycho-social problems (i.e., stress, anxiety, depression, and other psychological conditions) are of serious concern in global and South Asian context (8-12). Therefore, an onward urgency has been propagated to reinforce mental health system in most of the countries (6).

In Bangladesh, mental health services are severely constrained with only 0.16 psychiatrists, 0.34 psychologist, and 0.4 nurses per 100,000 population in urban areas, where only 0.49% of the healthcare providers trained to deliver mental health services (13). Mental health disorders pose a critical global and national burden, with a highly prevalent treatment gap in low-resource settings like Bangladesh. Despite the profound need for care, over 90% of individuals with mental health conditions do not receive required services (7) and are exceedingly inaccessible in rural areas (14, 15) due to the absence of mental health professionals, lack of mental health services in primary level facilities, asymmetrical formation of health facilities in urban areas and big cities, and unstructured national policies (15-17). To address these systemic gaps and overcome geographic isolation, the Non-Communicable Disease Control (NCDC) programme established tele-mental health services within government-facilitated "Wellbeing Centers" (WBC) at district and sub-district hospitals.

Tele mental health (TMH) has been found to be efficient for diagnosing and lessening common mental disorders and enhancing quality of life in

different ambience over mass population (18, 19). Besides, video-conference based tele-consultation is an empowering mode of service delivery for underserved populations in remote areas (20, 21) and can minimize logistical obstacles like delayed time to appointment, transportation, financial obligations, stigma related to traditional in-person consultancy (22-27). TMH has been established as an equivalent highly plausible medium of consultation for mood and psychotic disorders, substance misuse and dementia (18, 28, 29).

To systematically evaluate the early integration of these Wellbeing Centers into the health system, this study adopts a conceptual framework constructed by synthesizing Proctor et al.'s taxonomy with the implementation research guideline developed by the WHO (**figure 1**) (30, 31). This framework serves as our guiding approach, allowing us to explicitly operationalize key implementation constructs: feasibility (the intervention's fit with existing facility infrastructure and staff availability), accessibility (perceived ease of access to services for rural and vulnerable populations), acceptability (user satisfaction with privacy and the tele-mental format), and usefulness (the perceived effectiveness of the care). Moreover, directing our attention to specific intervention strategies (Inputs) for low-resource settings, we use the COATS framework (32) to guide task-sharing, defined as delegating screening activities to frontline health workers, and employ tele-mental health technologies (33).

[Insert Figure 1 here]

As illustrated in the conceptual framework, there is a distinct linkage between immediate implementation outcome and long-term clinical service outcomes. Mastering these mechanisms (i.e., ensuring high feasibility, accessibility, acceptability, and usefulness) of implementation is necessary prerequisite to driving initial service uptake. This uptake subsequently facilitates the ultimate clinical service outcomes, especially the reduction of depression and anxiety symptom (PHQ-9 & GAD-7) among users (34). Besides, limited published data and intervention studies on mental disorders hinders the implementation of a reliable, acceptable, adoptable and feasible intervention to raise awareness and improve mental health services in rural areas of Bangladesh (14, 15, 35). Therefore, the primary objective of this study was to assess the early implementation outcomes of the WBC tele-mental health model in rural Bangladesh to evaluate its potential for broader health system strengthening.

## **Materials and Method**

### **Study design**

An implementation research study was conducted in district and sub-district level, where the Wellbeing Center (WBC) - designed, developed, and implemented according to the WHO implementation framework (30) by the NCDC. The International Center for Diarrhoeal Disease Research, Bangladesh (icddr,b), along with the National Institute of Mental Health (NIMH), facilitated the implementation and assessment of the “Wellbeing Centers”. This study utilized a prospective observational implementation design, guided by the WHO implementation research framework, to

evaluate the real-world deployment of the Wellbeing Centers among active users (31).

### **Study settings**

Seven “Wellbeing Centers” were established across two district level hospitals and five sub-district level hospitals in Dinajpur district of Rangpur division, Netrokona and Sherpur district of Mymensingh division, and Noakhali and Chandpur district of Chattogram division. The selected facilities included Dinajpur district level hospital (DH), Netrokona district level hospital, Durgapur sub-district level hospital (UHC), Chirirbandar sub-district level hospital, Nakla sub-district level hospital, Chatkhil sub-district level hospital, and Matlab Dakshin sub-district level hospital (UHC) (**figure 2**). The Non-Communicable Disease Control (NCDC) programme of the Directorate General of Health Services (DGHS) recommended implementing Wellbeing Center services in these seven healthcare facilities.

[Insert Figure 2 here]

### **Establishment and activities of the Wellbeing Centers at the Healthcare Facilities**

The WBC was designed and established a district and sub-district implementation model through the engagement of different stakeholders and applying the WHO implementation framework.

***Developing a network of psychologists and psychiatrists:*** Through the guidance and mentorship of professional bodies in clinical and

counseling psychology, a qualified psychologist and psychiatrists has been established to provide mental health services.

***Setting up of the Wellbeing Centers:*** Each of the Wellbeing Centers were equipped with designated computer, internet access, and webcam. Besides, to ensure uninterrupted internet connection, each of the service centers were installed with routers, and in case of electricity failure, Uninterrupted Power Supply (UPS) units were used to mitigate power disruptions. Furthermore, headphones were provided to psychologists, psychiatrists, and clients to minimize the background noise. Utilizing the online platform, all of the appointment was scheduled, ensuring clients interaction with psychologists through videoconferencing. A separated room was designated within the hospital for the Wellbeing Center, especially dedicated to tele-mental health services while ensuring quality of the care with privacy and confidentiality. Moreover, the webcam with monitor was positioned at the eye level of the clients to ensure the approximate face-to-face interaction.

***Training of the service providers and related personnel:*** The icddr,b in collaboration with healthcare administrators with mental health expertise, along with the facility managers conduct training sessions and workshops for healthcare providers at the subdistrict and district levels. The service providers include residential medical officers (RMOs), physicians, Pediatricians, Obstetricians and Gynecologist, nurses and health workers. In addition, the implementation research team facilitated the introductory sessions for government and other healthcare staff to encourage participation in WBC activities. The sessions module covered various topics,

including the utilization of screening tools (i.e., depression and anxiety), management of patient and appointment scheduling, establishment of effective communication and liaison, incorporation of mental health services in outpatient care, efficient virtual patient interactions, technology use in mental healthcare delivery, referral pathways, follow-up strategies, and crisis management.

***Delivery of mental health services at the Wellbeing Centers:***

Initially, patients seeking care services at the healthcare facilities were referred to the Wellbeing Centers by physicians or other consultants. Subsequently, health workers screened and registered participants through a digital platform consisting of their user name and phone number. Based on the availability of the psychologists, appointments were scheduled by the health workers followed by sharing patient information and schedules with psychologists via an online meeting link. Health workers assisted patients in preparing for video-conference consultations with psychologists by safeguarding of confidentiality.

Psychologists measured psychological wellbeing conditions of the patients utilizing psychometric tools (i.e., PHQ-9 and GAD-7) and provided need-based counseling services accordingly. Service providers also created additional management strategies and scheduled follow-up visits according to the progress observed in each client. In cases where counseling service alone was insufficient for moderate-to-severe conditions, patients were referred to psychiatrists at the National Institute of Mental Health (NIMH). Thereafter, health workers scheduled these consultations with the psychiatrists, enabling further treatment through videoconference-based

counseling. During the follow-up visits, PHQ-9 and GAD-7 screenings were conducted again by the health workers to assess changes in patients' mental health status.

### **Study Objectives**

This study adapted WHO's implementation research framework and implementation outcome variables (30). Series of workshops and meeting were organized between the icddr,b research team and stakeholders (DGHS, NIMH, Dhaka University) engaged in WBC implementation to finalize the research objectives according to the WHO's framework and set a benchmark for successful demonstration for each outcome variable (**table 1**) (36). To move beyond descriptive reporting, we framed our specific objectives as measurable implementation outcomes benchmarked for success: 1) Feasibility, measured by the proportion of providers acknowledging infrastructural fit and staff capacity; 2) Accessibility, evaluated by the perceived ease of access to mental health services among users; 3) Acceptability, measured by user satisfaction regarding privacy and the tele-format; and 4) Usefulness, assessed by the perceived effectiveness of the intervention and actual symptom reduction (PHQ-9 and GAD-7 scores). By establishing these concrete, measurable outcomes, we aimed to systematically identify the determinants of successful implementation in a low-resource setting. In addition, this study also explores the prevalence and severity of depression and anxiety symptoms

among service receivers to determine the clinical need for mental health among study population.

**Table 1. Indicators of implementation outcome measured in this study according to objectives**

<b>Domain</b>	<b>Research Objectives</b>	<b>Proposed Indicators</b>	<b>Benchmark</b>
<b>WHO's framework (Implementation Outcome)</b>			
Service uptake	To measure the service uptake of WBC at district and sub-district level health facility	Number of patients getting services from the WBC	<b>Service Receivers</b>
Feasibility	To measure the feasibility of the WBC at district and sub-district level facility	Percentage of facility managers who perceived that WBC is implementable in the facility	<b>80%</b>
		Percentage of facility managers who perceived that they have adequately qualified staff to implement WBC.	<b>70%</b>
Accessibility	To measure the accessibility of mental healthcare among clients at WBC	Percentage of clients who perceived that WBC enhanced their access to mental healthcare services.	<b>80%</b>
Acceptability	To measure the acceptability of the WBC among clients	Percentage of clients who perceived mental health services from WBC as acceptable.	<b>80%</b>
Usefulness	To measure the usefulness of the WBC among clients	Percentage of clients who perceived mental health service from WBC as useful.	<b>80%</b>
<b>Clinical Need (Patient Profile)</b>			
Depression Symptoms	To measure the proportion of clients with depressive symptoms (To determine clinical need)	Percentage of patients who had moderate to severe depressive symptoms (PHQ-9).	<b>N/A</b>
Anxiety Symptoms	To measure the proportion of clients with anxiety symptoms (To determine clinical need)	Percentage of clients who had moderate to severe anxiety signs (GAD-7).	<b>N/A</b>

### **Study Participants**

Patients visited to the outpatient units in Dinajpur DH, Netrokona DH, Durgapur UHC, Chirirbandar UHC, Nakla UHC, Chatkhil UHC, and Matlab Dakshin UHC and received video-conference based counseling at the “Wellbeing Centers” were included in this study. Between January 2023 to October 13, 2025, 18,219 patients were screened using GAD-7 and PHQ-9 questionnaire in inpatient and outpatient departments of these 7 healthcare facilities. Among them, 7872 patients received services from 7 Wellbeing Centers. However, due to the missing observations 7825 clients were considered in formal analysis (**figure 3**). This study was designed for a diverse audience, encompassing key personnel such as facility managers (including Civil Surgeon Officers and Hospital Superintendents), Upazila Health and Family Planning Officers (UH&FPOs), Resident Medical Officers (RMOs) as well as Medical Officers (MOs) and healthcare providers at all the outdoor departments of the healthcare facilities. Therefore, quantitative survey was conducted among 167 service providers to assess implementation outcome of the Wellbeing Centers.

[Insert Figure 3 here]

### **Sampling**

The study employed a census approach target to involve all the patients received services from the Wellbeing Center (37, 38) for each of the research objectives according to the benchmark set for the successful demonstration (**Table 1**). A formal sampling calculation was not required, as the objective was to include all clients receiving service from the WBC during the study period, thus we included 7825 people. Besides, there were

167 service providers in study health facilities and they were also interviewed as part of the measurement of the implementation outcome of WBC. The number of clients who received first psychological follow-up counseling session was 814.

### **Data Collection Method and Tools**

The quantitative survey was led by qualified wellbeing staffs using tablets, received rigorous training on the study protocols, administration of the questionnaires, and ethical guidelines to minimize interviewer bias. A dedicated data entry interface with built-in data validation checks and logical skip patterns was also developed by the icddr,b research team to ensure strict quality control and minimize data entry errors. Socio-demographic data was collected through a designed quantitative questionnaire (39, 40), validated depression and anxiety symptoms screening in outpatient settings (41-44), acceptability (30), accessibility (30) usefulness (30), adoptability (30). WHO's improvement of health system and services for mental health guideline was used to assess the feasibility among health facility managers (30).

### **Outcome Measures**

Information on client's socio-demographic including age (years), gender, religion, marital status, profession, education (years) and income (BDT) were collected. To define implementation outcome (i.e., feasibility, acceptability, accessibility, usefulness, and service uptake) this study followed World Health Organization's guideline on implementation research in healthcare (30). Validated Telehealth Usability Questionnaire (39, 45)

was implemented to measure the acceptability, usability and service uptake. The acceptability, accessibility, usefulness and feasibility were evaluated through statements on a range of 1 (strongly disagree) to 5 (strongly agree). The Patient Health Questionnaire 9-items Scale (PHQ-9) (46) and the Generalized Anxiety Disorder 7-items Scale (GAD-7) (47) were utilized to assess the prevalence of depression and anxiety in inpatient and outpatient settings respectively. To quantify depression severity, we utilized the 9-item PHQ-9, which uses a 4-point Likert scale ranging from 'not at all' (0) to 'nearly every day' (3). Severity levels on the PHQ-9 are determined by a cumulative score ranging from 0 to 27, with diagnostic cut-offs situated at intervals of 5, 10, 15, and 20 to signify mild, moderate, moderately severe, and severe symptoms, respectively (48). The GAD-7 serves as a validated 7-item psychometric instrument for quantifying anxiety symptom severity, with individual items scored on a 4-point Likert scale ranging from 0 ("not at all") to 3 ("nearly every day"). Cumulative scores, which range from 0 to 21, are categorized into clinical severity tiers using established diagnostic thresholds: scores of 5, 10, and 15 represent the cut-off points for mild, moderate, and severe anxiety, respectively (48).

### **Statistical Analysis**

For data analysis, statistical software STATA (**version 18**) was used in this study. Descriptive statistics was used such as frequency distribution, percentage values, means (if it is normally distributed), and medians (if it

is not normally distributed) to describe the population and measurements. Categorical variables were analyzed by percentage points and numerical variables were measured by means with 95% confidence intervals. Descriptive statistics were applied for demographic characteristics of the “Wellbeing Center” users. Missing data was handled via listwise deletion, resulting in the exclusion of 47 incomplete records and yielding a final cohort of 7,825 clients for formal analysis. Prior to finalizing the multiple logistic regression models, essential model assumptions and diagnostics were evaluated. Especially, multicollinearity was measured utilizing Variance Inflation Factors (VIF) among significant variables, and overall goodness-of-fit was confirmed to ensure the reliability of adjusted odds ratios (aOR).

In order to find out the factors associated with acceptability, accessibility, usefulness, and prevalence of depression & anxiety bivariate and multivariate analysis was conducted. Due to the ceiling effect (lack of variance) in acceptability and usefulness scores, logistic regression was interpreted with caution, and our findings focus primarily on descriptive statistics and comparisons of clinical characteristics. All categorical variables were compared using Chi-square statistics; any difference was considered significance if  $p < 0.05$ . To determine the factors linked with the outcome variables, bivariate analysis was performed primarily using univariate logistic regression models. Following that, the association of the factors link with dependent variables was identified by conducting multiple logistic regression model. Variables were selected for the multivariable model based on a 10% significance threshold ( $p < 0.10$ ) in the bivariate

analysis; this is a standard epidemiological approach to avoid prematurely excluding potentially important confounding variables during initial screening (49). In the logistic model, accessibility, acceptability, and usefulness were measured if a participant “strongly agreed” that the WBC improved their accessibility to mental health services, had higher acceptance, and effective (usefulness). Results of multivariate analysis were reported as adjusted odds ratio (aOR) along with 95% CI.

To analytically manage the highly skewed, positive distributions inherent to self-reported implementation outcomes, we utilized a “top-box” dichotomization approach for our multivariable logistic regression models, isolating the “strongly agree” responses from all other categories. This approach is an established methodological standard in health services and patient safety research for analyzing Likert scale data and addressing potential ceiling effects. For instance, Wamuo et al. modeled patient experiences and satisfaction with telehealth visits by dichotomizing a 5-point Likert scale strictly to the “top box” (strongly agree) to calculate accurate odds ratios (50). Similarly, Khan et al. successfully utilized top-box multivariable logistic regression to evaluate hospital safety climates and communication openness among patients and families (51). Furthermore, the dichotomization of Likert scales in regression analysis allows for the clear identification of distinct, definitive attitudes among healthcare populations, as demonstrated by Ingravallo et al. when modeling professionals' attitudes toward clinical decision-making (52). By isolating the “strongly agree” category, our models successfully establish the predictors of definitive, highly positive perceptions of the Wellbeing Centers

while mitigating the analytical challenges posed by limited response variance.

### **Ethical considerations**

This implementation research received the ethical approval from the Ethical Review Committee of the International Center for Diarrhoeal Diseases Research, Bangladesh (protocol PR-22103). This followed after receiving rigorous scientific review by the Research Review Committee, which comprises a diverse body of scientific experts. The study involves no more than minimal risk of clients. We limited our discussion with participants to issues related to only outcome variables. Moreover, we kept participants' personal information anonymous and confidential. For future use, we used anonymous data to make sure this did not conflict with or violate the maintenance of privacy, anonymity, and confidentiality of the participants' information. Informed consent was formally obtained from all participants prior to data collection. Participants were thoroughly briefed on the study's purpose, the voluntary nature of their involvement, the minimal risks involved, and their right to withdraw at any time without their standard of care being affected.

## **Result**

### **Background Characteristics**

**Table 2** demonstrates the background characteristics of the participants who received services from the WBC. The typical service receiver profile

was a young adult female (74.8%, n=5852) aged 20-29 years (32.3%, n=2526), who was married (71.9%, n=5628) and had completed secondary education (36.7%, n=2870). The majority belonged to a low-income household (42.0%, n=3284) and accessed the tele-mental health services via a referral from a general ward (86.9%, n=6801) at a sub-district level facility (55.7%, n=4355).

[Insert Table 2 here]

### **Performance of Wellbeing Center against implementation outcomes**

**Figure 4** demonstrates the implementation outcome variables along with the requirement for the Wellbeing Center according to the WHO implementation guideline. Regarding the feasibility of the WBC, 96.4% (95% CI: 92.3-98.6) of the 167 surveyed service providers perceived that the tele-mental health model fit well with their existing facility infrastructure. However, operational feasibility emerged as a challenge, with half of the providers (49.7%, 95% CI: 41.8-57.5) reporting a lack of adequately trained human resources to sustain the centers. Among service receivers, near-universal positive responses (>99%) were recorded across all other implementation domains, indicating that the WBC successfully improved perceived accessibility to mental health care, that the tele-format was highly acceptable, and that the services provided were highly useful<sup>1</sup>.

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<sup>1</sup> Implementation outcome (IO) estimation are derived from selected individuals who screened positive and referred for mental health symptoms and completed tele-consultations at WBC. This selection inherently predisposed individuals to perceived benefit, which might cause higher reported IO scores.

[Insert Figure 4 here]

Despite this high acceptability, the clinical need remains severe, with 85.5% and 84.6% of service receivers experiencing moderate to severe anxiety and depression, respectively (**figure 5**).

[Insert Figure 5 here]

### **Determinants of implementation outcomes of the Wellbeing Centers**

**Table 3** summarizes the factors associated with client's acceptability, accessibility, and usefulness of the Wellbeing Center's service along with their determinants of both depression and anxiety. The accessibility at the WBC were 25% and 35% lower among people aged between 30-39 years (aOR: 0.75, 95% CI: 0.62-0.90) and over 50 years (aOR: 0.65, 95% CI: 0.53-0.81) compare to the people lower than 19 years respectively. The odds of perceived accessibility were 44% lower among people received postnatal care service (aOR: 0.56, 95% CI: 0.36-0.87) compare to who received ANC services. Besides, divorced participants (aOR: 0.50, 95% CI: 0.34-0.73) had 50% lower perceived accessibility compare to married people. Considering the education, people with primary, secondary, and higher education had 54%, 65%, and 63% lower perceived accessibility compare to people with no education respectively. Moreover, participants belong to high income group had 24% higher perceived accessibility (aOR: 1.24, 95% CI: 1.09-1.41) compare to participants with belong to lower household income group.

The odds of perceived acceptability was 38% lower among participants referred from general ward (aOR: 0.62, 95% CI: 0.51-0.76) compare to who referred from ANC services. Similarly, unmarried people had 35% lower perceived acceptability (aOR: 0.65, 95% CI: 0.52-0.81) compare to married people. People with primary, secondary, and higher education had 45%, 50%, and 45% lower perceived acceptability compare to people with no education respectively. Student had 34% higher odds of perceived acceptability (aOR: 1.34, 95% CI: 1.04-1.73) compare to housewife.

People aged higher than 50 years had 22% lower perceived usefulness of WBC services (aOR: 0.78, 95% CI: 0.61-0.99) compare to people aged lower than 19 years. The perceived usefulness was 33% lower among patients referred from general ward (aOR: 0.67, 95% CI: 0.55-0.82) compared to the patients referred from ANC services. The odds of increased usefulness were 35% lower among unmarried people (aOR: 0.65, 95% CI: 0.52-0.81) compare to married people. People with primary, secondary, and higher education had 34%, 37%, and 38% lower perceived usefulness compare to people with no education respectively.

The odds of experiencing from both the depression and anxiety was significantly associated with the increasing age of the participants and higher education. For example, people aged higher than 50 years had 56% higher depression and anxiety (aOR: 1.56, 95% CI: 1.24-1.96) compare to the people aged lower than 19 years and higher educated person had 48% higher depression and anxiety (aOR: 1.48, 95% CI: 1.20-1.83) compare to the people with no education. Unmarried participants had 24% fewer

depression and anxiety (aOR: 0.76, 95% CI 0.61-0.94) compared to the married participants. On the other hand, students were 29% more likely to experience anxiety and depression (aOR: 1.29, 95% CI: 1.09-1.65) compared to housewife. People with primary, secondary, and higher education had 35%, 49%, and 48% higher depression and anxiety compare to people with no education respectively. Whereas, participants visited to the district hospitals were 79% more likely to experience depression and anxiety (aOR: 1.79 95% CI: 1.62-1.98) highlighting the necessity for mental health services through the WBC.

[Insert Table 3 here]

The number of people receiving follow-up psychologist counseling services is illustrated in the **figure 6**. During the first visit 5033 people were suggested by psychologist for first follow-up counseling, where only 16.17% (814/5033 suggested for first follow-up visits till February, 2025) of the clients received first follow-up counseling service. The average PHQ-9 score reduced from 14.82 (SD 4.68) to 12.12 (SD 4.57), and the average GAD-7 score reduced from 13.79 (SD 3.61) to 11.20 (SD 3.84) between these 2 counseling sessions, demonstrating the usefulness of Wellbeing Center. These changes were statistically significant with  $p < .001$ .

[Insert Figure 6 here]

## **Discussion**

Guided by the WHO implementation research framework, our findings demonstrate the real-world early implementation outcomes of the Wellbeing Centers across district and sub-district facilities. By structuring

our evaluation around core implementation outcomes, we can better contextualize the success and challenges of this tele-mental health model within the broader health systems literature. Thus tele-mental health services have the potential to reduce excessive patient-incurred cost, travel time (53), lessen stigma by providing private and patient-oriented care (54), and improves accessibility for people living in rural area (55-57). To the best of our knowledge, this is one of the novel studies with pool of psychologist and psychiatric which report most of the WHO early implementation outcome variables including service uptake, feasibility, accessibility, acceptability, and usefulness of Wellbeing Centers' tele-mental health services within the district and sub-district implementation model.

Aligned with the WHO implementation framework, our evaluation of the Wellbeing Centers operationalized feasibility based on structural and human resource fit rather than patient satisfaction. While infrastructural feasibility was rated exceptionally high (96.4%), operational feasibility remains a critical barrier, with nearly half of the providers (49.7%) noting inadequate human resources to sustain the tele-mental health model. This highlights that while the physical integration of WBCs into primary care facilities is highly achievable, the immediate focus must shift toward workforce capacity building. Scaling up this intervention will require extensive training for staff to safely and effectively maintain telehealth technologies and conduct remote mental health services, as highlighted by similar global health implementations (58, 59). Failure in this regard can be resulted in dissatisfaction among client regarding the received services.

Beyond feasibility, the intervention demonstrated high early service uptake, particularly among young, educated females. This demographic trend aligns with existing literature suggesting that younger women have higher exposure to web-based technologies (60-62) and are more likely to proactively seek out tele-therapy due to a higher perceived severity of their mental health symptoms (63, 64).

Furthermore, the tele-mental health model successfully bridged traditional barriers to care, yielding near-universal perceived accessibility, acceptability, and usefulness among users. Evidence also revealed higher acceptability of tele-mental interventions in lower-middle income countries (65), where 71% pooled significant acceptability of tele-mental health services were revealed (66), due to the effectiveness in reducing the symptoms of depression and anxiety disorders (67, 68). Moreover, another cross-sectional study found that, 98% of the telehealth service receivers were comfortable with the services (69). In Bangladesh context, services related to mental health services has numerous challenges like shortage of resources and professionals and being heavily relied on the NIMH in Dhaka or other medical colleges situated in only cities (70, 71). Studies also revealed accessibility challenges due to the lack of visibility of the existing counseling platforms (72, 73) within the government system, WBC effectively bypass these geographical and social constraint. Existing evidence also revealed higher usefulness of digital psychological interventions, where prevalent mental health issues contributed highly in the global burden of diseases, especially in low- and middle-income countries (65, 74). Similarly, studies also suggested that, tele-mental

services are effective and useful for providing services across all age group, and people from different socio-economic and ethnic background (75). Besides, one meta-analysis showed 66% pooled statistical significant usability of tele-mental health services (66), as videoconferencing treatment has better outcome compare to face-to-face treatment in managing depression (76, 77). While initial reductions in average PHQ-9 and GAD-7 scores suggest high perceived usefulness of tele-mental health counseling, claiming sustained clinical improvement remains challenging because only 16.17% of referred clients received a first follow-up session. This low follow-up rate represents a significant barrier to assessing long-term treatment adherence and sustained clinical effectiveness. Similarly, these high satisfaction rating among the clients should be interpreted with caution due to the possibility of social desirability bias, common in patient satisfaction surveys conducted within health facilities (78).

Our multivariable analysis revealed that, patients referred from general wards, those who were unmarried or divorced, and individuals from lower-income or higher-education groups reported significantly lower odds of perceiving the WBC services accessible, acceptable, or useful. Similarly, studies revealed that, there is a effects of marital status on the healthcare accessibility, acceptability, and usefulness, especially among widowed and divorced people (79, 80). However, education had a reverse impact on our outcome of accessibility and acceptability, highlighting the requirement for further qualitative exploration. Studies also showed significant impact of income disparities on the accessibility of healthcare services, where low-income group people had lower accessibility and acceptability of telehealth

services (81). These disparities suggest that while the tele-mental health format mitigates overarching systemic barriers, vulnerable subgroups still face compounded socio-economic and cultural barriers, such as stigma or lack of digital literacy, which dampen their engagement with the service. Future iterations of the WBC model must incorporate targeted, culturally sensitive outreach to engage these specific, hard-to-reach populations.

The findings of this study also highlighted higher prevalence of depression (84.6%) and anxiety (85.5%) among WBC service receivers, consistent with previous findings of higher prevalence among ANC and PNC patients in Bangladesh (48), highlighting a crucial evidence of unmet need for mental care in low-resource settings like Bangladesh. On the other hand, follow-up service uptake was very low (16.17%), which may be a significant risk factor for relapse in individuals with depression and anxiety. Similarly, one telehealth study found lower rates of timely follow-up among patients aged 10 years and older, who were diagnosed with behavioral disorders, suicidal ideation or self-harm intention to mood disorders (82).

### **Strength of this study**

This study has several strengths according to the main findings we discussed earlier. This study was implemented in 7 different districts and sub-district level facilities, resulted in a large number of study population attending tele-mental healthcare services. Besides, this implementation research study was based on WHO's implementation research framework, where the research questions were finalized in consultation with different stakeholders (DGHS, NIMH, Dhaka University) and service providers.

Moreover, the analysis of this study was carried out following the WHO implementation research guideline's variable, resulted in standardization with other global implementation study on tele-mental health services. The intervention of the Wellbeing Centers service was delivered through the government system and will help the government for improving the health systems considering scaling up intervention programs to more facilities. Finally, this study also explored the determinants of implementation outcomes (i.e., accessibility, acceptability, and usefulness) of the Wellbeing Center.

### **Limitation of this study**

This study follows WHO's implementation framework, which can limit the scope of exploring other important outcomes for measuring implementation aspect of the Wellbeing Center. Second, the purposive selection of two district and five sub-district hospitals significantly limits the generalizability of our findings to the broader health system in Bangladesh due to the existence of regional variations in healthcare accessibility, infrastructure, and staff availability. Third, in our study we could not measure the adoption rate of the WBC services, rather we considered number of actual service users (clients). Fourth, the use of a census approach targeting only individuals who successfully accessed the Wellbeing Centers creates a self-selected sample. The absence of a comparison group comprising non-users limits our ability to evaluate population-level impact or the true extent of unmet mental health needs in

the broader community. Fifth, the outcome variables showing near-perfect (>99%) acceptability, accessibility, and usefulness must be interpreted with caution. Relying entirely on self-reported perceptions introduces ceiling effects and social desirability bias, likely inflating raw percentages as participants often respond favorably to please interviewers or ensure continued care (78, 83). Finally, our findings also demonstrated very few uptakes of the WBC follow-up services among clients, which needs further qualitative exploration.

## **Conclusion**

This implementation research study illustrated initial evidence of higher infrastructural feasibility, acceptability, accessibility, and usefulness of integrating the Wellbeing Centers' tele-mental health services into existing health systems of Bangladesh. According to our findings, introducing tele-mental health services in primary healthcare can overcome challenges associated with accessibility and acceptability among general population. Special emphasis can be given to low retention rates and human resource management with proper training to carry out tele-mental health services more effectively. While the tele-mental health model showed high initial service uptake and perceived usefulness, the low follow-up retention rate limits our ability to evaluate long-term clinical improvement. The policymakers can capitalize on these encouraging findings and endorse the integration of WBC at primary healthcare settings.

The study's design and alignment with WHO guidelines offer actionable insights for scaling up services nationally, where prioritizing infrastructure

resilience and workforce expansion can enhance equity. Future research should assess long-term impacts and cost-effectiveness, but these findings provide a model for integrating tele-mental health into primary care in low-resource settings, bridging critical gaps in mental health access.

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## List of Abbreviations

<b>Abbreviation</b>	<b>Full Form</b>
aOR	Adjusted Odds Ratio
ANC	Antenatal Care
BDT	Bangladeshi Taka
CI	Confidence Interval
DALYs	Disability Adjusted Life Years
DGHS	Directorate General of Health Services
DH	District Hospital
GAD-7	Generalized Anxiety Disorder 7-items Scale
icddr,b	International Center for Diarrhoeal Disease Research, Bangladesh
MH	Mental Health
MOs	Medical Officers
NCDC	Non-Communicable Disease Control
NIMH	National Institute of Mental Health
PHQ-9	Patient Health Questionnaire 9-items Scale
PNC	Postnatal Care
RMOs	Resident Medical Officers
SD	Standard Deviation
TMH	Tele Mental Health
UHC	Upazila Health Complex
UH&FPOs	Upazila Health and Family Planning Officers
UPS	Uninterrupted Power Supply
WBC	Wellbeing Center
WHO	World Health Organization

## Declaration

### Ethics approval and consent to participate

This study complies with the Declaration of Helsinki guidelines and received the ethical approval from the Ethical Review Committee of the International Center for Diarrhoeal Diseases Research, Bangladesh (protocol PR-22103). This followed after receiving rigorous scientific review by the Research Review Committee, which comprises a diverse body of scientific experts. The study involves no more than minimal risk of clients. However, before

each interview, study's purpose, procedures, potential risks, and benefits were explained to participants, and written or verbal informed consent was gained before the interview. In case of participants under the age of 16, written informed consent was obtained from their parents or legal guardians. Moreover, all participants' personal information was anonymous and confidential. For future use, we used anonymous data to make sure this did not conflict with or violate the maintenance of privacy, anonymity, and confidentiality of the participants' information. Participants had the full freedom and right to not participate in this study and to withdraw participation at any time during data collection.

#### **Consent for publication**

Not Applicable.

#### **Clinical trial number**

Not applicable.

#### **Availability of data and materials**

The data used in this study are not publicly available due to the confidentiality and ethical restrictions. However, they can be made available upon reasonable requests to the corresponding authors, subject to approval from the icddr,b.

#### **Competing interests**

The authors declare no competing interests.

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### **Authors' contributions**

MSS and ATH developed the manuscripts as the first author with support from AER. AER guided MSS and ATH in designing the study and developing the manuscript as a senior author. SEA and MRA reviewed the results and guided the team in interpreting the results. SH, MHR, and RMM contributed to data management and statistical analyses. TA, IJ, NGU, ZS, BA and PC supported the data management. SMHI supervised the implementation and field activities along with MAAM and MSI. JM, FS, SAS, FA, HUA, MM provided guidance in validating the psychological and psychiatric information of the study. MAK and SMMR provided support in developing the intervention strategy. SA and AA reviewed the first draft of the paper. All authors contributed to the interpretation of the results and read and approved the final version of the paper.

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## References

1. Haikal M, Doucette H, Meisel MK, Birch K, Barnett NP. Changes in college student anxiety and depression from pre-to during-COVID-19: Perceived stress, academic challenges, loneliness, and positive perceptions. *Emerging Adulthood*. 2022;10(2):534-45.
2. Burki TK. Coronavirus in china. *The Lancet Respiratory Medicine*. 2020;8(3):238.
3. Mahase E. Covid-19: WHO declares pandemic because of “alarming levels” of spread, severity, and inaction. *Bmj*. 2020;368(8):1036.
4. Global Burden of Disease Collaborative Network. Global Burden of Disease Study 2023 (GBD 2023) Results Seattle, United States: Institute for Health Metrics and Evaluation (IHME); 2024 [Available from: <https://vizhub.healthdata.org/gbd-results/>].
5. Global Burden of Disease Collaborative Network. GBD Compare: Institute for Health Metrics and Evaluation (IHME); 2024 [Available from: <https://vizhub.healthdata.org/gbd-compare/>].
6. Santomauro DF, Herrera AMM, Shadid J, Zheng P, Ashbaugh C, Pigott DM, et al. Global prevalence and burden of depressive and anxiety disorders in 204 countries and territories in 2020 due to the COVID-19 pandemic. *The Lancet*. 2021;398(10312):1700-12.
7. World Health Organization. National mental health survey of Bangladesh, 2018-19: Provisional fact sheet. 2019.
8. Balakrishnan V, Ng KS, Kaur W, Lee ZL. COVID-19 mental health prevalence and its risk factors in South East Asia. *Current Psychology*. 2022:1-16.
9. Tanha AF, Sheba NH, Islam MS, Potenza MN, Islam MR. A review of common mental health problems in the general population during the COVID-19 pandemic in South Asia. *Current Psychology*. 2022:1-21.
10. Nochaiwong S, Ruengorn C, Thavorn K, Hutton B, Awiphan R, Phosuya C, et al. Global prevalence of mental health issues among the general population during the coronavirus disease-2019 pandemic: a systematic review and meta-analysis. *Scientific reports*. 2021;11(1):10173.
11. Salari N, Hosseini-Far A, Jalali R, Vaisi-Raygani A, Rasoulpoor S, Mohammadi M, et al. Prevalence of stress, anxiety, depression among the general population during the COVID-19 pandemic: a systematic review and meta-analysis. *Globalization and health*. 2020;16(1):1-11.
12. Vindegaard N, Benros ME. COVID-19 pandemic and mental health consequences: Systematic review of the current evidence. *Brain, behavior, and immunity*. 2020;89:531-42.
13. World Health Organization. Bangladesh WHO special initiative for mental health situational assessment.: World Health Organization; 2020.
14. Dutta GK, Sarker BK, Ahmed HU, Bhattacharyya DS, Rahman MM, Majumder R, et al. Mental healthcare-seeking behavior during the

perinatal period among women in rural Bangladesh. *BMC Health Services Research*. 2022;22(1):310.

15. Hossain MD, Ahmed HU, Chowdhury WA, Niessen LW, Alam DS. Mental disorders in Bangladesh: a systematic review. *BMC psychiatry*. 2014;14(1):1-8.

16. Hasan MT, Anwar T, Christopher E, Hossain S, Hossain MM, Koly KN, et al. The current state of mental healthcare in Bangladesh: part 2-setting priorities. *BJPsych international*. 2021;18(4):82-5.

17. Tasdik Hasan M, Adhikary G, Mahmood S, Papri N, Shihab HM, Kasujja R, et al. Exploring mental health needs and services among affected population in a cyclone affected area in costal Bangladesh: a qualitative case study. *International journal of mental health systems*. 2020;14:1-9.

18. Sharma G, Devan K. The effectiveness of telepsychiatry: a thematic review. *BJPsych open*. 2021;7(S1):S51-S.

19. Guinart D, Marcy P, Hauser M, Dwyer M, Kane JM. Mental health care providers' attitudes toward telepsychiatry: a systemwide, multisite survey during the COVID-19 pandemic. *Psychiatric Services*. 2021;72(6):704-7.

20. Yuen EK, Herbert JD, Forman EM, Goetter EM, Juarascio AS, Rabin S, et al. Acceptance based behavior therapy for social anxiety disorder through videoconferencing. *Journal of Anxiety Disorders*. 2013;27(4):389-97.

21. Himle JA, Fischer DJ, Muroff JR, Van Etten ML, Lokers LM, Abelson JL, et al. Videoconferencing-based cognitive-behavioral therapy for obsessive-compulsive disorder. *Behaviour Research and Therapy*. 2006;44(12):1821-9.

22. Williams A, LaRocca R, Chang T, Trinh N-H, Fava M, Kvedar J, et al. Web-based depression screening and psychiatric consultation for college students: a feasibility and acceptability study. *International Journal of Telemedicine and Applications*. 2014;2014.

23. Tuerk PW, Yoder M, Ruggiero KJ, Gros DF, Acierno R. A pilot study of prolonged exposure therapy for posttraumatic stress disorder delivered via telehealth technology. *Journal of Traumatic Stress: Official Publication of The International Society for Traumatic Stress Studies*. 2010;23(1):116-23.

24. Moirangthem S, Rao S, Kumar CN, Narayana M, Raviprakash N, Math SB. Telepsychiatry as an economically better model for reaching the unreached: A retrospective report from South India. *Indian journal of psychological medicine*. 2017;39(3):271-5.

25. Eisenberg D, Golberstein E, Gollust SE. Help-seeking and access to mental health care in a university student population. *Medical care*. 2007;594-601.

26. Das S, Manjunatha N, Kumar CN, Math SB, Thirthalli J. Telepsychiatric after care clinic for the continuity of care: A pilot study from an academic hospital. *Asian Journal of Psychiatry*. 2020;48:101886.
27. Chakrabarti S. Usefulness of telepsychiatry: A critical evaluation of videoconferencing-based approaches. *World journal of psychiatry*. 2015;5(3):286.
28. Fernandez E, Woldgabreal Y, Day A, Pham T, Gleich B, Aboujaoude E. Live psychotherapy by video versus in-person: A meta-analysis of efficacy and its relationship to types and targets of treatment. *Clinical Psychology & Psychotherapy*. 2021;28(6):1535-49.
29. Lichstein KL, Scogin F, Thomas SJ, DiNapoli EA, Dillon HR, McFadden A. Telehealth cognitive behavior therapy for co-occurring insomnia and depression symptoms in older adults. *Journal of Clinical Psychology*. 2013;69(10):1056-65.
30. Peters DH, Tran NT, Adam T. *Implementation research in health: a practical guide*: World Health Organization; 2013.
31. Proctor E, Silmere H, Raghavan R, Hovmand P, Aarons G, Bunger A, et al. Outcomes for implementation research: conceptual distinctions, measurement challenges, and research agenda. *Administration and policy in mental health and mental health services research*. 2011;38(2):65-76.
32. Orkin AM, Rao S, Venugopal J, Kithulegoda N, Wegier P, Ritchie SD, et al. Conceptual framework for task shifting and task sharing: an international Delphi study. *Human resources for health*. 2021;19(1):61.
33. Chakrabarti S. Digital psychiatry in low-and-middle-income countries: new developments and the way forward. *World Journal of Psychiatry*. 2024;14(3):350.
34. Lund C, Tomlinson M, Patel V. Integration of mental health into primary care in low-and middle-income countries: the PRIME mental healthcare plans. *The British Journal of Psychiatry*. 2016;208(s56):s1-s3.
35. Fabian KE, Muanido A, Cumbe VF, Manaca N, Hicks L, Weiner BJ, et al. Optimizing treatment cascades for mental healthcare in Mozambique: preliminary effectiveness of the Systems Analysis and Improvement Approach for Mental Health (SAIA-MH). *Health Policy and Planning*. 2020;35(10):1354-63.
36. Rahman AE. Feasibility of introducing pulse oximetry for identifying hypoxaemia among children with pneumonia in paediatric outpatient settings in Bangladesh: generating evidence and synthesising knowledge for influencing policy, programme planning and practice: University of Edinburgh; 2022.
37. Groves RM, Fowler Jr FJ, Couper MP, Lepkowski JM, Singer E, Tourangeau R. *Survey methodology*: John Wiley & Sons; 2011.
38. Australian Bureau of Statistics. *Census and sample*: Australian Bureau of Statistics; 2025 [Available from:

<https://www.abs.gov.au/statistics/understanding-statistics/statistical-terms-and-concepts/census-and-sample>.

39. Ackerman M, Greenwald E, Noulas P, Ahn C. Patient satisfaction with and use of telemental health services in the perinatal period: a survey study. *Psychiatric Quarterly*. 2021;92:925–33.
40. Kılıç ST, Taşgıt A. Sociodemographic factors affecting depression-anxiety-stress levels and coping strategies of parents with babies treated in neonatal intensive care units during the COVID-19 pandemic. *Journal of Neonatal Nursing*. 2023;29(2):375–86.
41. Dhira TA, Rahman MA, Sarker AR, Mehareen J. Validity and reliability of the Generalized Anxiety Disorder-7 (GAD-7) among university students of Bangladesh. *PloS one*. 2021;16(12):e0261590.
42. Kamrul-Hasan A, Hannan MA, Asaduzzaman M, Rahman MM, Alam MS, Amin MN, et al. Prevalence and predictors of diabetes distress among adults with type 2 diabetes mellitus: a facility-based cross-sectional study of Bangladesh. *BMC Endocrine Disorders*. 2022;22(1):28.
43. Naher R, Rabby MRA, Sharif F. Validation of patient health questionnaire-9 for assessing depression of adults in Bangladesh. *Dhaka University Journal of Biological Sciences*. 2021;30(2):275–81.
44. Shih SC, Chan AS, Yeung EY, Tsang AM, Chiu RL, Chu MH, et al. Psychometric properties of Chinese version of work and social adjustment scale for outpatients with common mental disorders: Classical test theory and Rasch analysis. *East Asian Archives of Psychiatry*. 2021;31(4):97–104.
45. Parmanto B, Lewis Jr AN, Graham KM, Bertolet MH. Development of the telehealth usability questionnaire (TUQ). *International journal of telerehabilitation*. 2016;8(1):3.
46. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. *Journal of general internal medicine*. 2001;16(9):606–13.
47. Spitzer RL, Kroenke K, Williams JB, Löwe B. A brief measure for assessing generalized anxiety disorder: the GAD-7. *Archives of internal medicine*. 2006;166(10):1092–7.
48. Hossain AT, Rahman MH, Manna RM, Akter E, Islam SH, Hossain MA, et al. Enhancing access to mental health services for antepartum and postpartum women through telemental health services at wellbeing centers in selected health facilities in Bangladesh: implementation research. *JMIR Pediatrics and Parenting*. 2025;8:e65912.
49. Bursac Z, Gauss CH, Williams DK, Hosmer DW. Purposeful selection of variables in logistic regression. *Source Code for Biology and Medicine*. 2008;3(1):17.
50. Wamuo O, Hyun N, Holt JM, Somai MM, Crotty BH. Patient and Provider Factors Associated With Successfully Addressing Medical Needs Using Telehealth: A Cross-Sectional Survey. *Managed care*. 2023;8:51.

51. Khan A, Parente V, Baird JD, Patel SJ, Cray S, Graham DA, et al. Association of patient and family reports of hospital safety climate with language proficiency in the US. *JAMA pediatrics*. 2022;176(8):776-86.
52. Ingravallo F, Sandroni S, D'Addio L, Miccinesi G. Do you agree with the doctor's decision to continue treatment?: A scenario-based study of hospital nurses in Italy. *Annali dell'Istituto Superiore di Sanità*. 2015;51:352-7.
53. Rabinowitz T, Murphy KM, Amour JL, Ricci MA, Caputo MP, Newhouse PA. Benefits of a telepsychiatry consultation service for rural nursing home residents. *Telemedicine and e-Health*. 2010;16(1):34-40.
54. Alis Behavioral Health. Telehealth for Mental Health: Alis Behavioral Health; 2024 [Available from: <https://www.alisbh.com/blog/telehealth-for-mental-health/>].
55. Manfredi L, Shupe J, Batki SL. Rural jail telepsychiatry: a pilot feasibility study. *Telemedicine Journal & E-Health*. 2005;11(5):574-7.
56. Morland LA, Greene CJ, Rosen CS, Foy D, Reilly P, Shore J, et al. Telemedicine for anger management therapy in a rural population of combat veterans with posttraumatic stress disorder: a randomized noninferiority trial. *The Journal of clinical psychiatry*. 2010;71(7):20772.
57. Weiner MF, Rossetti HC, Harrah K. Videoconference diagnosis and management of Choctaw Indian dementia patients. *Alzheimer's & Dementia*. 2011;7(6):562-6.
58. Banbury A, Taylor ML, Gray LC, Reid N, Smith AC. Sustaining and expanding telehealth activity: Training requirements for Australian residential aged care front-line staff. *PEC Innov*. 2023;2:100109.
59. Appleton R, Barnett P, Vera San Juan N, Tuudah E, Lyons N, Parker J, et al. Implementation strategies for telemental health: a systematic review. *BMC Health Serv Res*. 2023;23(1):78.
60. Marshall J, Blavin F, O'Brien C, Parekh A, Smith LB. Patient characteristics associated with frequent telehealth utilization in 2022: Evaluation of a national virtual integrated medical and behavioral health practice within the United States. *Preventive Medicine Reports*. 2024;46:102871.
61. Olfson M, McClellan C, Zuvekas SH, Wall M, Blanco C. Trends in outpatient psychotherapy among adults in the US. *JAMA psychiatry*. 2025;82(3):253-63.
62. Stubbe DE. Enhancing adherence: using mobile health technology to improve self-management for individuals with schizophrenia. *Focus*. 2020;18(4):424-7.
63. Doherty DT, Kartalova-O'Doherty Y. Gender and self-reported mental health problems: predictors of help seeking from a general practitioner. *British journal of health psychology*. 2010;15(1):213-28.
64. Kim YK, Small E, Pounders RD, Fall SL, Wilson WL, editors. Ecological factors of telemental healthcare utilization among adolescents

with increased substance use during the COVID-19 pandemic: the moderating effect of gender. *Child & Youth Care Forum*; 2024: Springer.

65. Mishkind MC. How telemental health delivered to non-traditional locations helped prepare for responses to COVID-19. *Mhealth*. 2021;7:17.

66. Abuyadek RM, Hammouda EA, Elrewany E, Elmalawany DH, Ashmawy R, Zeina S, et al. Acceptability of tele-mental health services among users: a systematic review and meta-analysis. *BMC Public Health*. 2024;24(1):1143.

67. Batastini AB, Paprzycki P, Jones AC, MacLean N. Are videoconferenced mental and behavioral health services just as good as in-person? A meta-analysis of a fast-growing practice. *Clinical psychology review*. 2021;83:101944.

68. Berryhill MB, Culmer N, Williams N, Halli-Tierney A, Betancourt A, Roberts H, et al. Videoconferencing psychotherapy and depression: a systematic review. *Telemedicine and e-Health*. 2019;25(6):435-46.

69. Sinha Gregory N, Shukla AP, Noel JJ, Alonso LC, Moxley J, Crawford AJ, et al. The feasibility, acceptability, and usability of telehealth visits. *Frontiers in medicine*. 2023;10:1198096.

70. Hasan MT, Anwar T, Christopher E, Hossain S, Hossain MM, Koly KN, et al. The current state of mental healthcare in Bangladesh: part 1 - an updated country profile. *BJPsych Int*. 2021;18(4):78-82.

71. Islam A, Biswas T. Mental health and the health system in Bangladesh: situation analysis of a neglected domain. *Am J Psychiatry Neurosci*. 2015;3(4):57-62.

72. Esho Nije Kori - Best Mental Health Organization in Bangladesh 2016 [Available from: <https://www.eshonijekori.com/about-us>].

73. Mental Health Service Directory. ADD International Bangladesh, 2023 [Available from: <https://add.org.uk/wp-content/uploads/2024/01/Bangladesh-Mental-Health-Service-Directory-in-English.pdf>].

74. O'Brien M, McNicholas F. The use of telepsychiatry during COVID-19 and beyond. *Ir J Psychol Med*. 2020;37(4):250-5.

75. Hilty DM, Ferrer DC, Parish MB, Johnston B, Callahan EJ, Yellowlees PM. The effectiveness of telemental health: a 2013 review. *Telemedicine and e-Health*. 2013;19(6):444-54.

76. Chong J, Moreno F. Feasibility and acceptability of clinic-based telepsychiatry for low-income Hispanic primary care patients. *Telemedicine and e-Health*. 2012;18(4):297-304.

77. Fortney JC, Pyne JM, Edlund MJ, Williams DK, Robinson DE, Mittal D, et al. A randomized trial of telemedicine-based collaborative care for depression. *Journal of general internal medicine*. 2007;22(8):1086-93.

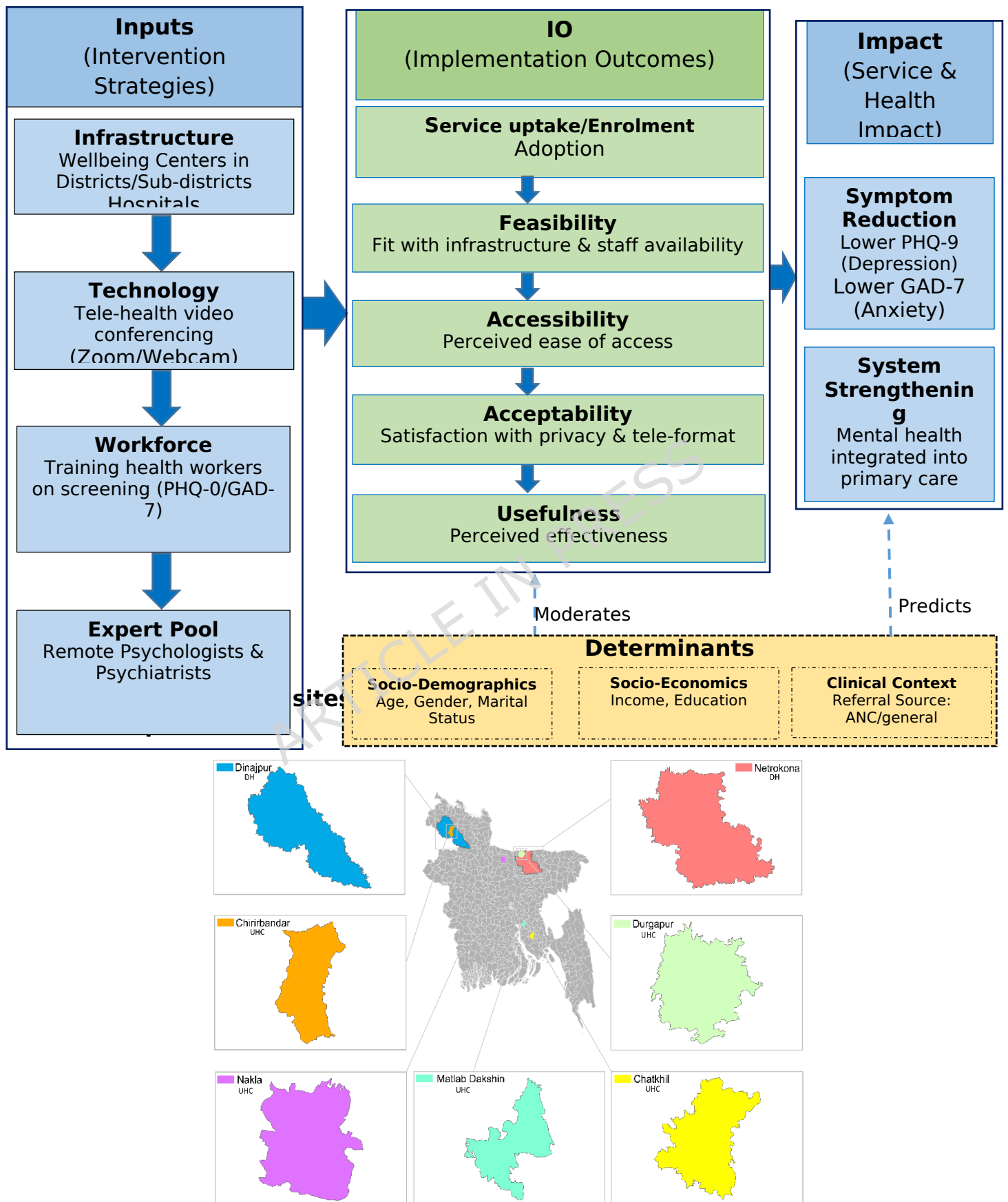
78. Sitzia J, Wood N. Patient satisfaction: a review of issues and concepts. *Social science & medicine*. 1997;45(12):1829-43.

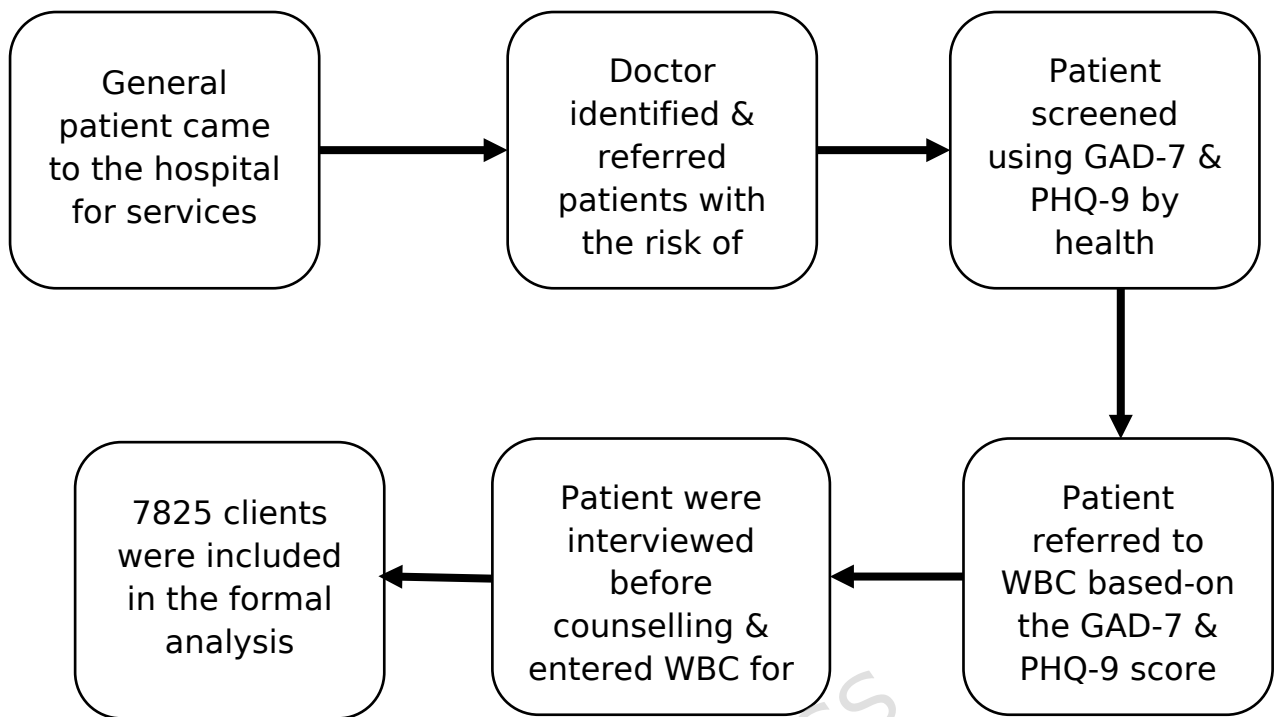
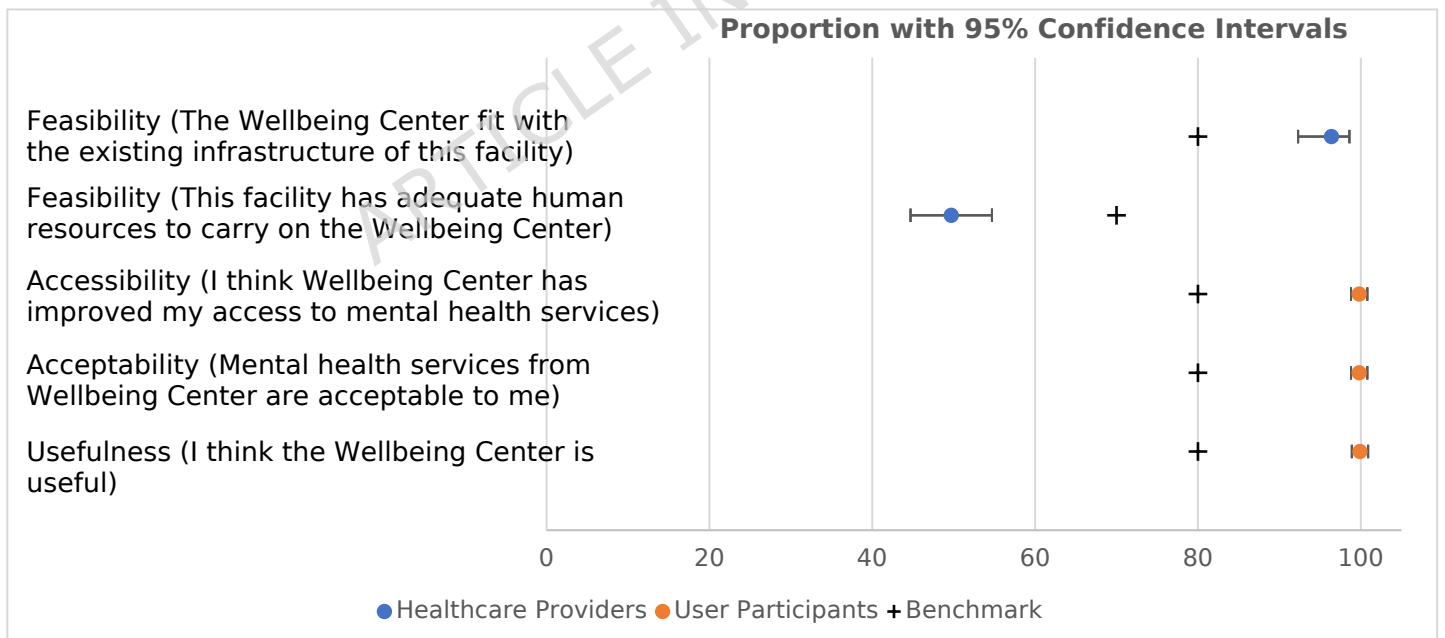
79. Joung I, Van der Meer J, Mackenbach J. Marital status and health care utilization. *International Journal of Epidemiology*. 1995;24(3):569-75.
80. Butler J, Morgan M. Marital Status, Illness and the Use of Health Service. 1974.
81. Jin T, Cheng L, Wang K, Cao J, Huang H, Witlox F. Examining equity in accessibility to multi-tier healthcare services across different income households using estimated travel time. *Transport Policy*. 2022;121:1-13.
82. Blackburn J, Sen B, Jillur Rahim M, Sharma P, Brisendine A, Morrisey MA, et al. Use of Telehealth for Follow-up Care After Children's Mental Health Hospitalizations. *Hospital Pediatrics*. 2025;15(2):158-68.
83. Crow H, Gage H, Hampson S, Hart J, Kimber A, Storey L, et al. Measurement of satisfaction with health care: Implications for practice from a systematic review of the literature. *Health technology assessment*. 2002;6(32).

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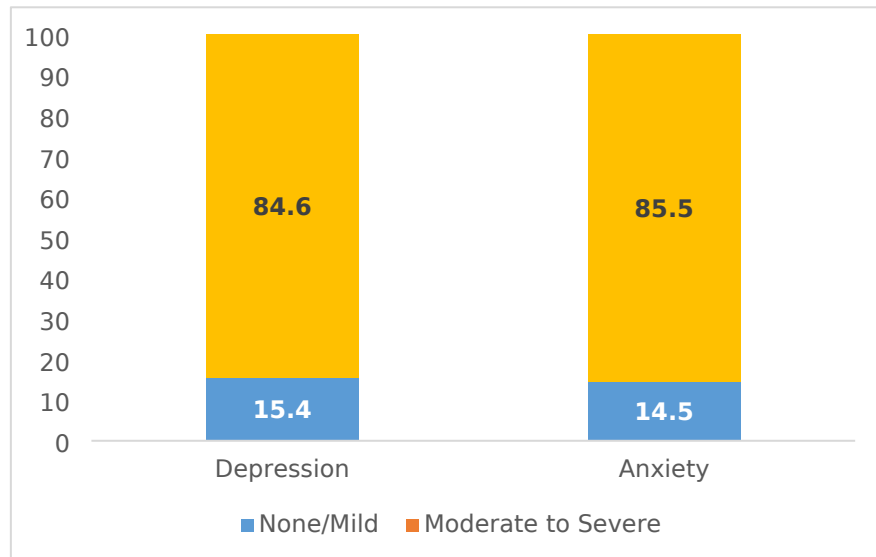
**Early Feasibility of Telemedicine-based Mental Health Wellbeing  
Centers: An implementation study in district and sub-district  
health facilities in Bangladesh**

**Figure 1. Conceptual Framework of this Study**

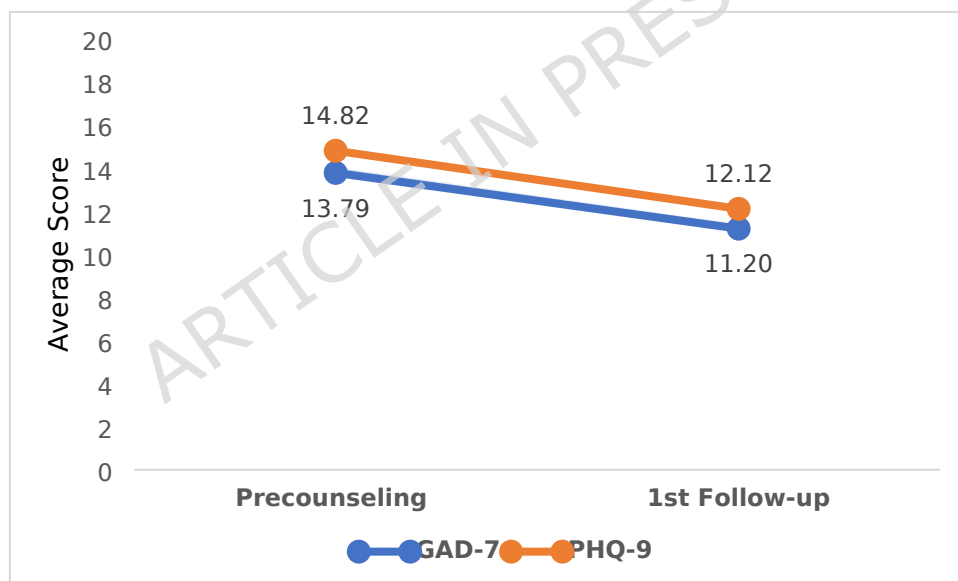


**Figure 3.** Study participants selection process of this study**Figure 4. Implementation outcomes of Wellbeing Centers according to the World Health Organization implementation guidelines**

**Figure 5. Prevalence of Depression and Anxiety Severity among Service Receivers (N=7,825)**



**Figure 6. The usefulness of the counseling in reducing the average PHQ-9 and GAD-7 (n=814)**



**Table 2. Background characteristics of the participants who received services from Wellbeing Centers (N=7,325)**

<b>Background Characteristics</b>	<b>Participants n (%)</b>
<b>Gender</b>	
Male	1973 (25.2)
Female	5852 (74.8)
<b>Age (in years)</b>	
<19	1416 (18.1)
20-29	2526 (32.3)
30-39	1631 (20.8)
40-49	1077 (13.8)
≥ 50	1175 (15.0)
<b>Type of contact care points at the facility</b>	
ANC <sup>2</sup>	919 (11.7)
PNC <sup>3</sup>	105 (1.3)
General ward	6801 (86.9)
<b>Religion</b>	
Islam	7281 (93.1)
Others <sup>4</sup>	544 (7.0)
<b>Marital Status</b>	
Married or in a domestic partnership	5628 (71.9)
Divorced	134 (1.7)
Unmarried	1708 (21.8)

<sup>2</sup> ANC: antenatal care.<sup>3</sup> PNC: postnatal care.<sup>4</sup> Hindus, Buddhists, and Christians

<b>Background Characteristics</b>	<b>Participants n (%)</b>
Others <sup>5</sup>	355 (4.5)
<b>Profession</b>	
Housewife	4615 (59.0)
involved in work	1252 (16.0)
Students	1428 (18.3)
Others <sup>6</sup>	530 (6.8)
<b>Education (years completed)</b>	
No education	869 (11.1)
Primary (1-5)	1969 (25.2)
Secondary (6-10)	2870 (36.7)
Above secondary ( $\geq 11$ )	2117 (27.1)
Mean (SD)	7.74 (4.75)
<b>Household income (BDT)</b>	
Low (<12,000)	3284 (42.0)
Middle (>12,000-18,000)	2851 (36.4)
High (>18,000)	1690 (21.6)
Mean (SD)	18516.99 (18337.63)
<b>Type of facility location</b>	
District	3470 (44.4)
Subdistrict	4355 (55.7)

**Table 3. Factors associated with implementation outcomes of Wellbeing Center, presented in adjusted odds ratios, N=7825**

<b>Variable</b>	<b>Accessibility</b>	<b>Acceptability</b>	<b>Usefulness</b>	<b>Both depression &amp; anxiety</b>
	<b>aOR (95% CI)</b>	<b>aOR (95% CI)</b>	<b>aOR (95% CI)</b>	<b>aOR (95% CI)</b>
<b>Gender</b>				
Male	Ref	Ref	Ref	Ref
Female	0.96 (0.82-1.11)	0.89 (0.75-1.05)	0.94 (0.80-1.11)	1.15 (0.98-1.36)
<b>Age (in years)</b>				
<19	Ref	Ref	Ref	Ref
20-29	0.87 (0.75-1.02)	1.00 (0.84-1.20)	0.98 (0.82-1.17)	1.32** (1.11-1.57)
30-39	0.75** (0.62-0.90)	0.96 (0.78-1.19)	0.85 (0.69-1.05)	1.39** (1.13-1.71)
40-49	0.75** (0.61-0.92)	1.10 (0.87-1.39)	1.01 (0.80-1.29)	1.48** (1.18-1.85)

<sup>5</sup> Widowed & others

<sup>6</sup> Unemployed and unable to work due to disability

Variable	Accessibility	Acceptability	Usefulness	Both depression & anxiety
	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)
≥ 50	0.65*** (0.53-0.81)	0.94 (0.74-1.20)	0.78* (0.61-0.99)	1.56*** (1.24-1.96)
<b>Type of contact care points at the facility</b>				
ANC	Ref	Ref	Ref	Ref
PNC	0.56** (0.36-0.87)	0.79 (0.49-1.29)	0.66 (0.41-1.06)	0.89 (0.52-1.52)
General ward	1.00 (0.85-1.18)	0.62*** (0.51-0.76)	0.67*** (0.55-0.82)	2.17*** (1.79-2.64)
<b>Religion</b>				
Islam	Ref	Ref	Ref	Ref
others	0.93 (0.77-1.11)	1.10 (0.90-1.35)	1.19 (0.97-1.46)	1.04 (0.86-1.25)
<b>Marital Status</b>				
Married or in a domestic partnership	Ref	Ref	Ref	Ref
Divorced	0.50*** (0.34-0.73)	0.83 (0.56-1.21)	0.76 (0.52-1.11)	1.28 (0.89-1.83)
Unmarried	0.91 (0.75-1.12)	0.65*** (0.52-0.81)	0.65*** (0.52-0.81)	0.76* (0.61-0.94)
Others	0.77* (0.61-0.97)	0.70** (0.54-0.90)	0.68** (0.53-0.87)	1.15 (0.91-1.46)
<b>Profession</b>				
Housewife	Ref	Ref	Ref	Ref
Involved in work	1.17 (0.98-1.39)	1.07 (0.88-1.31)	1.03 (0.85-1.26)	0.78* (0.65-0.95)
Students	0.84 (0.67-1.05)	1.34* (1.04-1.73)	1.08 (0.84-1.39)	1.29* (1.01-1.65)
Others	1.09 (0.87-1.37)	0.99 (0.77-1.28)	0.97 (0.76-1.25)	1.58*** (1.25-2.00)
<b>Education (years completed)</b>				
No education	Ref	Ref	Ref	Ref
Primary	0.46*** (0.38-0.54)	0.55*** (0.45-0.68)	0.66*** (0.54-0.81)	1.35** (1.12-1.63)
Secondary	0.35*** (0.30-0.42)	0.50*** (0.40-0.62)	0.63*** (0.51-0.77)	1.49*** (1.23-1.80)
Above secondary	0.37*** (0.31-0.46)	0.55*** (0.44-0.70)	0.62*** (0.50-0.78)	1.48*** (1.20-1.83)
<b>Household income</b>				
Low	Ref	Ref	Ref	Ref
Middle	1.05 (0.94-1.16)	1.10 (0.97-1.24)	0.94 (0.83-1.06)	0.97 (0.86-1.08)
High	1.24** (1.09-1.41)	0.95 (0.82-1.09)	0.98 (0.85-1.13)	0.90 (0.78-1.03)

Variable	Accessibility	Acceptability	Usefulness	Both depression & anxiety
	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)
<b>Type of facility location</b>				
Subdistrict	Ref	fRef	Ref	Ref
District	0.99 (0.90-1.08)	1.11 (1.00-1.24)	0.96 (0.87-1.07)	1.79*** (1.62-1.98)

Note: \*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$ s

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