


The 5-Item Who Well-Being Index as a Screening Tool for Depression in a Population of Doctors and Nurses in Nigeria during the COVID-19 Pandemic

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Abstract

Background: Undetected depression can result in a significant decline in productivity among the workforce in every system, the healthcare sector inclusive. It is vital to utilize brief screening tools to detect populations at risk of depression. The 5-item WHO Well-being Index (WHO-5) has been used as a screening measure for depression, but research on this is scarce in sub-Saharan Africa. This study aimed to determine the utility and validity of the WHO-5 in screening for depression in a population of doctors and nurses in Nigeria during the COVID-19 pandemic. **Methods:** A representative sample of medical doctors and nurses across Nigeria (n = 464), completed the 5-item World Health Organization Well-Being Index (WHO-5) and the 9-item Patient Health Questionnaire (PHQ-9). **Results:** The pattern of factors associated with cases of a positive depression screening was considerably similar for the WHO-5 and the PHQ-9. At a cut-off score of 50 for the WHO-5, the sensitivity and specificity values obtained were 0.857 and 0.851 respectively. Positive and negative predictive values were 0.404 and 0.981 respectively. ROC analysis of the WHO-5 against the PHQ-9 revealed that, at a cut-off of 50, the sensitivity of the WHO-5 was 0.857, 1-specificity was 0.152. The AUC was 0.918 (95% CI 0.884-0.953). Also, there was a strong, negative correlation between the WHO and the PHQ-9 scores ($r = -0.590$, $p \leq 0.0001$). **Conclusion:** The WHO-5 well-being index has satisfactory validity as a screening tool for the detection of depression. It is also feasible for use in very busy settings, because of its brevity and ease of administration.

Keywords

WHO-5, Depression, Healthcare Professionals, COVID-19, Nigeria

1. Background

Depressive disorder is a serious public health challenge and a source of immense emotional distress and disability (Cassano & Fava, 2002). Health care professionals (HCPs), such as doctors and nurses under the demanding nature of their work are confronted with a great risk of mental health challenges which may exacerbate or precipitate depressive disorder and other mental illnesses (Pappa et al., 2020; Salari et al., 2020; Vizheh et al., 2020). Regrettably, mental health problems such as depression in HCPs, are mostly over looked not only by the public but also by the HCPs themselves (Williams, Chung, & Muennig, 2017). Depression has been identified as a major risk factor for suicide among physicians and nursing professionals (Kalmoe, Chapman, Gold, & Giedinghagen, 2019; Silva et al., 2015). Undetected depression can result in substantial impairment in personal, occupational, social and family functioning. Interestingly, most cases of depression are often undetected/undiagnosed and untreated (Williams et al., 2017). The consequences of undetected and untreated depression in HCPs confer a huge burden on the health care system and may invariably determine the efficiency of the system, as well as the health outcomes of the patients (Williams et al., 2017).

Worldwide the health sector has undeniably experienced an unparalleled crisis since the onset of the COVID-19 pandemic (World Health Organisation, 2021). Expectedly, just as in other parts of the globe, the health system in Nigeria has not been spared from this exceptional crisis. Recent reports during this pandemic have consistently demonstrated that health care professionals are at increased risk of developing psychological disorders such as depression (Pappa et al., 2020; Salari et al., 2020; Vizheh et al., 2020). This may be precipitated by the higher workload and work pressure that accompany periods of disaster, especially related to working in the frontline, being exposed to higher risks of infection, poor working conditions including poor infrastructure, limited availability of personal protective equipment and inadequate remuneration. A recent systematic review and meta-analysis reported a 22.8% pooled prevalence of depression among healthcare workers from 10 studies during the COVID-19 pandemic (Pappa et al., 2020). Also, an examination of specific subgroups from 5 studies between doctors and nurses revealed that the pooled prevalence was 30.30% for nurses and 25.37% for doctors (Pappa et al., 2020). Similar rates have also been reported by other researchers, concerning depression among frontline HCPs during the COVID-19 pandemic (Salari et al., 2020; Vizheh et al., 2020). These findings are in keeping with previous studies from the SARS epidemic, which showed that the onset of a sudden and immediately life-threatening illness could lead to extraordinary amounts of pressure on healthcare workers (Wu et al., 2009).

Putting into perspective the dire consequences of undetected and untreated depression, it becomes needful to employ proactive and brief measures in identifying populations at risk of depression. This will facilitate the planning of effective intervention strategies. Therefore, screening for depression among frontline HCPs is an important step targeted towards improving the already scarce resources and overall productivity of the health care system especially during demanding times.

The 5-item World Health Organization well-being index (WHO-5), potentially addresses some of the feasibility challenges in screening for depression in a wide range of settings (Topp, Østergaard, Søndergaard, & Bech, 2015). The items cover essential features of depression, including mood, interests, and energy. Thus, even though this measure was initially designed to assess subjective well-being among medical patients, it has been used successfully to screen for depression in diverse contexts such as primary care settings (Topp et al., 2015). The WHO-5 is an easily scored, straightforward screening tool, which contains positively worded items as opposed to symptom or problem worded items (Topp et al., 2015). Its brevity, easy understandability, and potential for fewer stigmas favor better feasibility and utility in very busy settings. A review of the existing literature showed that, compared with other well-established measures of depression, the WHO-5 demonstrated adequate psychometric properties following utilization in primary care, other clinical and non-clinical settings as a screening tool for depression (Topp et al., 2015). A study conducted in Ethiopia has also underscored its very promising role as a screening tool for depression; however, the need for more research to test its utility in diverse contexts was highlighted, particularly in low resource settings, where brief and efficient measures are very important (Garland et al., 2018).

Although the WHO-5 is a valid screening tool for depression with good psychometric properties in several clinical and non-clinical settings (Topp et al., 2015), our literature search, on the other hand, found limited data on validation studies for its use as a screening instrument for depression in the non-clinic population in sub-Saharan Africa, particularly in Nigeria (Garland et al., 2018). This study, therefore, aimed to assess the utility and validity of the WHO-5 well-being index in screening for depression in a population of medical doctors and nurses in Nigeria. Expectantly, screening and early identification of cases of depression using short measures such as the WHO-5 would help to inform best practices, as regards the mental health of HCPs and other at-risk populations.

2. Methodology

2.1. Setting and Design

This is a cross-sectional online survey of doctors and nurses in Nigeria.

2.2. Study Participants

All consenting medical doctors and nurses who practice in both public and pri-

vate health care institutions in Nigeria (primary, secondary and tertiary) were included in the study.

2.3. Sampling Technique and Data Collection

A sample of eligible participants was obtained by convenience sampling method. A total of 464 participants were interviewed through online platforms for doctors and nurses in Nigeria, using semi-structured and structured questionnaires incorporating socio-demographics, basic clinical history, mental well-being assessment, and an assessment of depression. The recruitment of participants spanned between April and July 2020.

2.4. Measures

2.4.1. The Socio-Demographic and Clinical History

Information about the respondent's age, gender, marital status and the occupation was obtained. Also, clinical variables such as, the presence of an underlying medical condition and a history of mental illness were ascertained as well.

2.4.2. The 5-Item World Health Organization Well-Being Index (WHO-5)

This is a short and generic global rating scale measuring subjective well-being. The measure was first introduced in its present form in 1998 by the WHO Regional Office in Europe as part of the DEPCARE project on well-being measures in primary health care (World Health Organization (WHO), 1998). The WHO-5 contains five positively phrased items, which include: 1) "I have felt cheerful and in good spirits", 2) "I have felt calm and relaxed", 3) "I have felt active and vigorous", 4) "I woke up feeling fresh and rested" and 5) "My daily life has been filled with things that interest me". The respondent is asked to rate how well each of the 5 statements applies to him or her when considering the last 14 days. Each of the 5 items is scored from 5 (all of the time) to 0 (none of the time). The raw scores therefore theoretically ranges from 0 (absence of well-being) to 25 (maximal well-being). For ease of data analysis, the overall score of 25 is multiplied by a 4, this gives a maximum score of 100. A cut-off score of ≤ 50 on the WHO-5 is used to assign a "screening diagnosis" of depression (Topp et al., 2015). Findings from 8 studies revealed that at a cut-off score of ≤ 50 , the mean sensitivity for major depression was 0.87, and the mean specificity for major depression was 0.76 (Topp et al., 2015). Thus, the WHO-5 has adequate validity, it is a sensitive and specific screening tool for depression and it is highly applicable across study fields (Topp et al., 2015).

2.4.3. The 9-Item Patient Health Questionnaire (PHQ-9)

This consists of nine items, each of which is scored 0 to 3, providing a 0 to 27 severity score (Spitzer, Kroenke, Janet, Williams, & Group, 1999). PHQ-9 severity is calculated by assigning scores of 0, 1, 2, and 3, to the response categories of: Not at all, several days, more than half the days, and nearly every day, respectively. PHQ-9 total score for the nine items range from 0 to 27. It consists of the

nine criteria for depression from the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV). The PHQ-9 is comparable or superior in operating characteristics, and valid as both a diagnostic and severity measure (Kroenke & Spitzer, 2002; Kroenke, Spitzer, & Williams, 2001). Scores of 5, 10, 15, and 20 represent cut points for mild, moderate, moderately severe, and severe depression, respectively. It is recommended that, if a single screening cut off point were to be chosen, a PHQ-9 score of 10 or greater, which has sensitivity for major depression of 88%, a specificity of 88% would be preferred (Kroenke et al., 2001). Also, findings from a study that validated the PHQ-9 in Nigeria, showed that the optimal cut-off score for the major depressive disorder was 10, with sensitivity and specificity values of 0.846 and 0.994 respectively (Adewuya, Ola, & Afolabi, 2006).

2.5. Ethical Considerations

Ethical clearance was obtained from the Irrua Specialist Teaching Hospital's research and ethical committee. Informed consent was obtained from each participant. Confidentiality and anonymity were ensured by not requesting for the names or any form of the participant's contact.

2.6. Statistical Analysis

The Statistical package for the Social Sciences 21 (SPSS.21) program was used for statistical analysis. Participants were classified as cases or non-cases of depression based on a PHQ-9 cut-off of 10 and above. Bivariate analyses were conducted using Chi-square, to identify socio-demographic factors associated with a positive screen for depression for each of the instruments. Fisher's exact test was used for cells with expected frequencies < 5.

Screening parameters including sensitivity, specificity, predictive values, false positive and negative rates, as well as the Correct Classification /misclassification rates were calculated for the WHO-5 scores. The measurement performance of the WHO-5 was compared against the PHQ-9 diagnosis for depression using the receiver operating characteristic (ROC) curve. The area under the curve (AUC) was also calculated. Pearson's correlation was used to assess convergent validity between the WHO-5 total scores and measures of the PHQ-9. All tests were 2-tailed, and the level of significance was set at $P < 0.05$.

3. Results

3.1. Socio-Demographic Characteristics of Participants

The mean age (\pm SD) of the participants was 39.85 (\pm 8.49) years, with their ages ranging between 21 to 63 years. Two hundred and seventy-five participants (59.3%) were female, over two-thirds of the participants were married ($n = 354$; 76.3%). The mean (\pm SD) number of years of experience/practice for participants was 12.36 (\pm 8.47) and two hundred and ninety-six (63.8%) participants were medical doctors.

3.2. Prevalence of Depression.

Table 1 highlights the severity measures of depression using the PHQ-9. Mild depression was identified in 80 participants (17.2%). However, the optimal cut-off score of 10 (which is indicative of major depression), yielded a prevalence of 10.6% positive screen for depression using the PHQ-9 (n = 49), corresponding with moderate to severe levels of depression. The prevalence of probable depression using the WHO-5 at a cut-off score of ≤ 50 was 22.4% (n = 104), corresponding with perceived poor well-being.

3.3. Demographic Factors Associated with Positive Screen for Depression

As highlighted in **Table 2**, the pattern of factors associated with cases of a positive depression screening was considerably similar for the WHO-5 and the PHQ-9. Specifically, significant factors associated with the WHO-5 depression screening status include: being single/separated/widowed, having a lifetime history of a psychological illness, and having contracted the COVID-19 infection.

3.4. Classification Accuracy of the WHO-5 as a Screening Tool for Depression

The measurement properties of the WHO-5 were calculated from the values depicted in **Table 3**. Using a cut-off score of 50 for the WHO-5, the sensitivity and specificity values obtained were 0.857 and 0.851 respectively. While the positive predictive value (PPV) was 0.404 and the negative predictive value (NPV) was, 0.981 respectively. The false positive (FP) rate was 0.149, while the false negative (FN) rate was 0.143 and the overall correct classification rate was 0.851 (misclassification rate was 0.149). However, when a cut-off score of 28 was used, poorer validity measures were gotten. The sensitivity and specificity values obtained at the cut-off score of 28 were, 0.449 and 0.964 respectively.

This implies that at a cut-off score of 50, 86% of cases of likely depression (based on the PHQ-9), were correctly identified by the WHO-5. While 85% of the non-cases of depression (based on the PHQ-9) were identified by the WHO-5. In other words, compared with the PHQ-9 scores, the WHO-5 index identified 15% as false positive and 14% as false negatives.

Table 1. PHQ-9 as a measure of depression severity.

Variable	Frequency (n = 464)	Percentage (%)
PHQ-9 severity of depression		
Minimal/None	335	72.2
Mild	80	17.2
Moderate	40	8.6
Moderately Severe	7	1.5
Severe	2	0.4

Table 2. Characteristics of participants relative to a positive screen for depression using the PHQ-9 and WHO-5.

Variables	N = 464	PHQ-9 cases (%)	Descriptive statistics	WHO-5 cases (%)	Descriptive statistics
Age:					
<40 years	253	27 (10.7)	$X^2 = 0.007$	57 (22.5)	$X^2 = 0.003$
≥40 years	211	22 (10.4)	$P = 0.932$	48 (22.7)	$P = 0.955$
Gender:					
Male	189	14 (7.4)	$X^2 = 3.356$	36 (19.0)	$X^2 = 2.337$
Female	275	35 (12.4)	$P = 0.067$	69(25.1)	$P = 0.126$
Occupation:					
Doctor	296	24 (8.1)	$X^2 = 5.205$ $OR = 5.019$	63 (21.3)	$X^2 = 0.845$
Nurse	168	25(14.9)	$P = 0.023$	42 (25.0)	0.358
Marital Status:					
Single/Separated/Widowed	109	13 (11.9)	$X^2 = 0.282$	33 (30.3)	$X^2 = 4.757$ $OR = 4.542$
Married/Cohabiting	355	36 (10.1)	$P = 0.596$	72 (20.3)	$P = 0.029$
Diagnosed with or receiving treatment for a chronic medical condition:					
Yes	139	14 (10.1)	$X^2 = 0.050$	32 (23.0)	$X^2 = 0.017$
No	325	35 (10.8)	$P = 0.823$	73 (22.5)	$P = 0.895$
Ever been diagnosed with a psychological illness:					
Yes	26	6 (23.1)	$X^2 = 4.569$ $OR = 3.612$	13 (50.0)	$X^2 = 11.785$ $OR: 9.933$
No	438	43 (9.8)	$P = 0.033$	92 (21.0)	$P = 0.001$
Has a friend or loved one been infected with COVID-19?					
Yes	107	16 (15.0)	$X^2 = 2.841$	31 (29.0)	$X^2 = 3.195$
No	357	33 (9.2)	$P = 0.092$	74 (20.7)	$P = 0.074$
Have you been infected with COVID-19?					
Yes	21	5 (23.8)	$X^2 = 4.088$ $OR = 3.188$	9 (42.9)	$X^2 = 5.140$ $OR = 4.457$
No	443	44 (9.9)	$P = 0.043$	96 (21.7)	$P = 0.023$
Had close contact or managed a case(s) of COVID -19?					
Yes	101	11 (10.9)	$X^2 = 0.015$	26 (25.7)	$X^2 = 0.715$
No	363	38 (10.5)	$P = 0.903$	79 (21.8)	$P = 0.398$
Availability of Personal Protective Equipment (PPE):					
Available but not sufficient	354	38 (10.7)		82 (23.2)	
Sufficiently available	37	2 (5.4)	$X^2 = 1.294$	8 (21.6)	$X^2 = 0.260$
Not available at all [†]	73	9 (12.3)	$P = 0.577^{FE}$	15 (20.5)	$P = 0.603$

Key: N = Total sample, P = Probability, X^2 = Chi square, OR = Odds ratio, FE = Fisher's exact

Table 3. Screening status for depression.

WHO-5	PHQ-9		Total	PHQ-9		Total	
	Positive (≥10)	Negative (<10)		WHO-5	Positive (≥10)		Negative (<10)
Positive (≤50)	42	62	104	Positive (≤28)	22	15	37
Negative (>50)	7	353	360	Negative (>28)	27	400	427
Total	49	415	N = 464	Total	49	415	N = 464

3.5. ROC Analysis of the WHO-5 Tested against the PHQ-9

ROC analysis of the WHO-5 tested against the PHQ-9 diagnosis of depressive disorder revealed that the questionnaire performed well in detecting participants with depressive symptomatology. At a cut of 50, the sensitivity of the WHO-5

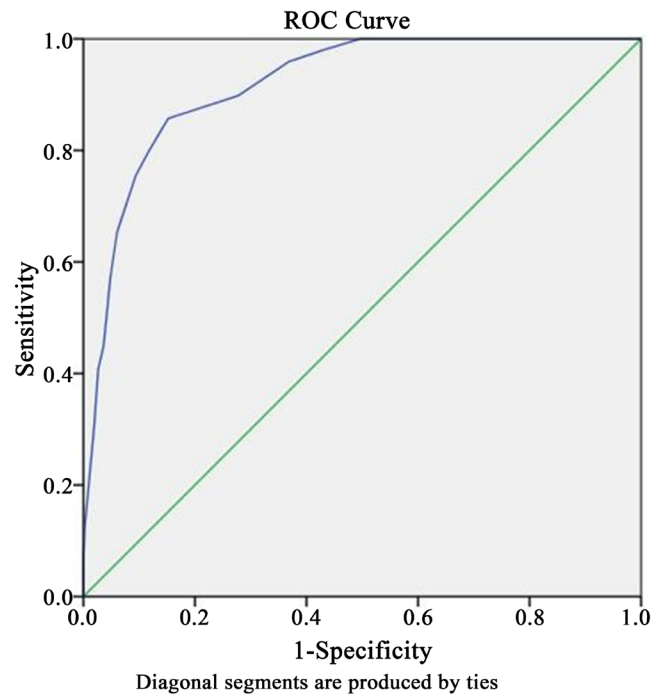


Figure 1. The Receiver Operating Characteristic (ROC) curve of the WHO-5 in screening for depression.

was 0.857, 1-specificity was 0.152. The AUC was 0.918 (95% CI 0.884 - 0.953). The performance of the WHO-5 against the PHQ-9 is shown in the ROC curve in **Figure 1**.

3.6. Agreement between the WHO-5 and the PHQ-9

The agreement between the WHO-5 and the PHQ-9 was determined by assessing for the pattern of correlation between the WHO-5 and the PHQ-9. Our findings revealed that there was a strong, negative correlation between the well-being and depression scores, which was statistically significant ($r = -0.590$, $p \leq 0.0001$). This implies that as the WHO-5 well-being scores decrease, PHQ-9 scores increase, connoting more depressive symptomatology in association with poorer well-being.

4. Discussion

The findings of this study reinforce the use of the WHO-5 well-being index as a screening tool to identify depression among a population of doctors and nurses in Nigeria. To our knowledge, this is the first study conducted in Nigeria, to report the use of the WHO-5 for screening for depression. The prevalence rates of depression and the probable cases of depression identified by the PHQ-9 and the WHO-5, point towards the psychological problems experienced by frontline health care professionals especially during demanding periods.

Notably, our results revealed similarities in the socio-demographic factors associated with a positive screen for depression using both the WHO-5 and the PHQ-9. Precisely, significant factors associated with the WHO-5 depression screen-

ing status include: being single/separated/widowed, having a lifetime history of a psychological illness, and having contracted COVID-19 infection. One can thus infer that individuals with the background or underlining vulnerabilities are more likely to suffer depression during stressful times. Additionally, our findings also suggest that the COVID-19 infection itself confers significant risk for depression, possibly resulting from biological/neurological, emotional and/or social precipitating factors.

Besides, findings from our assessment of the criterion validity of the WHO-5 against the PHQ-9, point to a better sensitivity for the cut-off score of 50 for the WHO-5 as a likely screening measure for depression compared to a cut-off score of 28 in our study population. Similarly, previous research assessed the WHO-5 against the PHQ-9, and better sensitivity for the cut-off of 50 compared to a cut-off of 28 in patients with Type 1 and 2 Diabetes Mellitus was also reported (Hajos et al., 2013). The high sensitivity of the WHO-5, suggests that the cut-off score of 50 as indicative of further testing for depression. Also, the high sensitivity and specificity of the WHO-5, minimizes the possibility of assigning false negatives and positives, respectively.

The sensitivity and specificity of the WHO-5 in our study is comparable to findings from other studies that assessed DSM-IV depression by various structured interviews as their “gold standard” (Topp et al., 2015). An assessment of the mean sensitivity and the mean specificity for DSM major depression was 0.87 and 0.76 respectively, for about 8 studies that utilized various structured interviews as their “gold standard” and a cut-off score of ≤ 50 on the WHO-5 (Topp et al., 2015). These findings are also similar to the sensitivity and specificity values obtained from studies that used the other less structured interviews as their “gold standard” against the WHO-5. For instance, a study carried out in the Netherlands, found a sensitivity of 0.79 and a specificity of 0.88, when the WHO-5 was assessed against the PHQ-9 (Hajos et al., 2013). In the same vein, a study conducted in Ethiopia, reported a sensitivity of 71% and a specificity measure of 92%, using the WHO-5 against the PHQ-9 as well (Garland et al., 2018). The WHO-5 has performed remarkably in detecting positive screens for depression, even though it was not designed to make a definitive diagnosis of depressive disorder, its constancy as a screening tool supports its validity.

5. Strengths and Limitations

The strengths of our study include: It is the first study conducted in Nigeria, to report the use of the WHO-5 for screening for depression. Also, it was conducted in a region where there is a paucity of research data, with a consequent need for validated screening instruments. However, our findings should be construed with due considerations on the following limitations: First, even though the PHQ-9 is a well-validated screening and diagnostic tool for depression, it is still not regarded as a “standard” diagnostic instrument for depression. Also, the study design was cross-sectional and it could only screen for possible cases of depression

among the study participants at a point in the course of the COVID-19 pandemic.

6. Conclusion

The results suggest that the WHO-5 well-being index is a satisfactory screening tool for the detection of depression in HCPs during challenging times. The scale demonstrated adequate sensitivity and specificity. Also, the convergence with the PHQ-9 “gold standard” was acceptable. Future research may consider validation of this screening tool amongst other study population, for instance, community studies assessing the validity of the WHO-5 as a screening tool for depression in the general population.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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