

Assessment of the Diagnostic Validity of the Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5) Using the Mini International Neuropsychiatric Interview (MINI) among Road Traffic Accident (RTA) Victims Attending a Tertiary Hospital in Southwest Nigeria

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Abstract

Background: Post-traumatic stress disorder (PTSD) is a common mental health condition among road traffic accident (RTA) victims. Early identification is essential; however, there is a need for simple and reliable screening tools. The PTSD Checklist for DSM-5 (PCL-5) is widely used, but its diagnostic validity requires evaluation in Nigeria. **Objective:** To assess the diagnostic validity and reliability of the PCL-5 in identifying PTSD among road traffic accident victims using the Mini International Neuropsychiatric Interview (MINI) as the gold standard. **Methods:** A cross-sectional study was conducted among 40 road traffic accident victims. Data were collected using a structured questionnaire, the PCL-5, and the MINI. Diagnostic performance of the PCL-5 was evaluated using sensitivity, specificity, positive and negative predictive values, and overall accuracy. Receiver operating characteristic (ROC) curve analysis was used to determine discriminative ability. Agreement between instruments was assessed using Cohen's kappa statistic, while internal consistency was

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evaluated using Cronbach's alpha. **Results:** The mean age of respondents was 34.6 ± 10.6 years, with a predominance of males. The PCL-5 demonstrated a sensitivity of 75.0%, specificity of 92.9%, positive predictive value of 81.8%, negative predictive value of 89.7%, and overall accuracy of 87.5%. The area under the ROC curve was 0.91, indicating excellent discriminative ability. Cohen's kappa value of 0.695 indicated substantial agreement between the PCL-5 and the MINI. The PCL-5 also showed excellent internal consistency (Cronbach's alpha = 0.917). **Conclusion:** The PCL-5 is a valid and reliable screening tool for PTSD among road traffic accident victims, demonstrating high specificity, good sensitivity, excellent discriminative ability, and strong internal consistency. However, confirmatory diagnosis using structured clinical interviews such as the MINI remains essential.

Keywords

PTSD, PCL-5, Diagnostic Validity, Reliability, Road Traffic Accident

1. Introduction

The Post-Traumatic Stress Disorder Checklist (PCL) is a globally used Diagnostic and Statistical Manual of Mental Disorders 4th edition (DSM-IV) based self-report measure of Posttraumatic Stress Disorder (PTSD) symptoms. It was revised to reflect the Diagnostic and Statistical Manual of Mental Disorders 5th edition (DSM-5) changes to the PTSD criteria by the National Center for PTSD [1] to give rise to Post-Traumatic Stress Disorder Checklist for DSM-5 (PCL-5). PCL-5 is a 20-item self-report measure of the twenty DSM-5 symptoms of PTSD in adult populations. It was designed for use with people who have experienced traumatic events to assess the presence and severity of PTSD symptoms and monitor treatment over time. It has been widely used by clinicians and researchers in Western countries to screen for PTSD and has been found to have very good psychometric properties [2]-[4]. The respondents rate 20 statements about specific PTSD symptoms such as intrusions, avoidance, hyperarousal and negative alterations in cognitions and mood based on how much they have been bothered by them in the past month. In Africa, the only study that has been conducted to validate PCL-5 in Zimbabwe found it to have good psychometric properties at cut-off point ≥ 33 [5]. Though some instruments have been validated in Nigeria and have been used in many studies to screen for PTSD, these tools are not based on DSM-5 which is the latest edition of the American Psychiatric Association's Diagnostic Manual of Mental Disorders.

PTSD is defined as an anxiety disorder that develops in reaction to physical injury or severe mental or emotional distress, such as military combat, violent assault, natural disaster or other life-threatening events [6]. Other life-threatening events include: road traffic accidents (RTA), torture, rape and so on. It is a common disorder globally as it has been found that 70% of people globally will experience a potentially traumatic event during their lifetime [7], although only about

5.6% will develop the disorder [8]. Worldwide, 3.9% of the population has experienced PTSD at one time or the other in their lives [8]. Although the prevalence of PTSD varies depending on the subgroup of the general population sampled and the particular traumatic event involved, in the United States and Canada, the lifetime prevalence was found to range from 6.1% to 9.2% in the general population [8] [9], while one-year prevalence ranged from 3.5% to 4.7% [9] [10]. Nigeria is not an exception, a country where banditry, kidnapping, inter-communal and inter-religious conflicts are rife coupled with high rate of severe road traffic accidents due to bad roads, it is not unexpected that the rate of PTSD will be high. Although, to the best of the knowledge of the authors, no study has been conducted to estimate the lifetime prevalence of PTSD in the general population in Nigeria, several studies have found high rates among specific groups. For instance, a study by Beisser & colleagues in South-South Nigeria found PTSD prevalence rates as high as 60% in a community with direct exposure to conflict and 14.5% in a community with no direct exposure [11]. Also, in Plateau State, North-Central Nigeria, rates of PTSD as high as 55.5% & 9.8% have been found among respondents in those conflict exposed and not exposed groups respectively [12]. Similarly in Southwest Nigeria, a part of Nigeria where banditry & communal conflicts are less common, high rates of PTSD have been found in various groups [13]-[15].

Involvement in road traffic accident can be an exceptionally stressful life event, and it is a recognized cause of PTSD. The prevalence of PTSD among survivors have been found to vary widely across studies [16]. In Nigeria, few studies that have been conducted among RTA victims found high rate of post-traumatic stress symptoms/disorder: Mosaku *et al.* found that at least 35% of their subjects scored above the cut-off points on all the three subscales of the Impact of Event Scale (IES-R) used in their study to assess post-traumatic stress symptoms [17], while Asuquo *et al.* [18] and Itake *et al.* [19] found PTSD rates of 41.3% and 26.7% respectively among survivors of RTA.

PCL-5 is the most current screening tool, which is based on DSM-5 and it has not been validated in Nigeria. Hence, the decision by the authors to assess its diagnostic validity.

2. Methods

2.1. Setting of the Study

A cross-sectional survey carried out at the Orthopaedics department of the Federal Teaching Hospital, Ido-Ekiti (FETHI), Ekiti state, South-West Nigeria. The hospital is a tertiary healthcare facility that caters for the secondary & tertiary healthcare needs of residents of Ekiti state and neighboring states. The department is staffed with 4 Orthopaedic surgeons, 2 resident doctors, 10 trained Orthopaedic nurses & other paramedical staff. It has a 24 bedded male ortho ward & 8 female orthopaedic beds, runs two outpatient clinics weekly with patient load of about 40 (per clinic) and has two operating days per week.

2.2. Study Population

Adult patients attending the trauma clinic as well as in-patients of the orthopaedic unit of the hospital were used for the study.

Inclusion criteria; having been involved in RTA not less than a month and not later than one year before being approached for the study, age from 18years and above and consent to participate in the study.

Exclusion criteria; patients who sustained head injury in the accident with loss of consciousness. those with previous history of mental illness and those who were critically ill at the time of the study, were exempted from the study.

- **Participants**

Convenient sampling method was used in this study. All patients who presented at the clinic or on admission during the period of the study (April to October 2024), meeting the inclusion criteria and consented to participate, were recruited into the study. Thus, the sample size was determined and limited by the number of patients that met the inclusion criteria during the period of 6 months. Therefore, 48 RTA patients who attended the clinic as well as those on admission who met the study criteria during the study period were approached for the study, 4 declined, leaving 44 subjects (91.7%) who finally participated in the study.

2.3. Instruments

A *socio-demographic interview schedule* was purposely constructed by the authors to elicit information on demographic variables such as age, gender, marital status, educational status and employment status.

- *Post-traumatic Stress Disorder Checklist for DSM-5 (PCL-5)* is a 20-item self-report questionnaire that assesses the 20 DSM-5 symptoms of PTSD. It can be variably used to monitor symptoms change during and after treatment, screening for PTSD and making a provisional PTSD diagnosis. It is an updated version of PCL for DSM-IV but unlike the latter that has three versions, it has only one version though there are three formats of PCL-5; one without a criterion A component, one with a Criterion A component and one with the Life Events Checklist for DSM-5 (LEC-5) and extended Criterion A component. PCL-5 with a Criterion A component was used for this study. The self-report rating scale ranges from 0 - 4 for each symptom and its descriptors are; “Not at all”, “A little bit”, “Moderately”, “Quite a bit” and “Extremely”. It can be completed by the subjects and takes 5 - 10 mins to complete while the interpretation is made by the clinician. PCL-5 can be scored in many ways; a total symptom severity score (range 0 - 80) can be obtained by summing the score for each of the 20 items, DSM-5 symptom cluster severity scores can be obtained by summing the scores for the items within a given cluster, *i.e.*; cluster B (items 1 - 5), cluster C (items 6 - 7), cluster D (items 8 - 14) and cluster E (items 15 - 20). A provisional PTSD diagnosis can be made by treating each item rated as 2 (Moderately) or higher as a symptom endorsed, then following

the DSM-5 diagnostic rule which requires at least; one B item, one C item, two D items and two E items. A cut-off range of 31 - 33 is indicative of probable PTSD. For this study, the cut-off score of 33 will be used.

- *Mini International Neuropsychiatric Interview (MINI)* is a short, structured diagnostic interview developed initially in 1990 by Psychiatrists and Clinicians in the United States and Europe for DSM-III-R and ICD-10 psychiatric disorders [20] with an administration time of approximately 15 minutes. However, it has been updated to meet both DSM-IV (MINI 6.0) and DSM-5 (MINI 7.0.2) diagnostic criteria, it is the most preferred structured psychiatric interview for psychiatric evaluation and outcome tracking in clinical trials and epidemiological studies. MINI has been used by several authors in Nigeria, Adewuya et.al showed it has high acceptability and reliability [14]. It has several divisions into modules and each module corresponds to a diagnostic entity. Before each module there are screening questions. It can assess and identify the 17 most common disorders in mental health (clinical and research settings). The PTSD module was used in this study to validate PCL-5.

2.4. Procedure for Data Collection

All consecutive adult patients who attended the out-patient clinic as well as those on admission who met the inclusion criteria were approached for data collection. Each respondent after signing the informed consent form was given the composite questionnaire (which included the socio-demographic interview schedule and the PCL-5 only) to fill in a private room, while the research assistants were around to guide, confidentiality being strictly ensured. Research assistants were Resident Doctors who had spent minimum of 2 years in training in psychiatry. The PTSD module of the MINI was subsequently administered immediately after the first stage on each of the respondents, in a separate room, by the 4th author (who was a Senior Registrar then and trained on how to use MINI) without having prior knowledge of the result of the earlier interview. Both the PCL-5 and the MINI PTSD module were anchored to the same RTA as the traumatic event experienced by each subject.

2.5. Statistical Analysis

Data were analysed using IBM SPSS version 27. Descriptive statistics were used to summarize variables, with continuous data presented as mean $\pm$ standard deviation and categorical data presented as frequencies and percentages.

The diagnostic validity of the PCL-5 was assessed against the MINI using sensitivity, specificity, positive and negative predictive values, and accuracy, with a cut-off score of ≥ 33 . Receiver operating characteristics (ROC) curve analysis was used to determine descriptive ability (AUC).

Agreement between the two tools was assessed using Cohen's kappa statistic, while internal consistency of the PCL-5 was evaluated using Cronbach's alpha.

All statistical tests were conducted at a 95% confidence level, and results were considered statistically significant at $p < 0.05$.

2.6. Ethical Consideration

Ethical approval was obtained from the Ethic and Research committee of the hospital before the commencement of the study. Written informed consent form was signed by each subject, after adequate explanation, before being recruited into the study.

3. Results

A total of 48 patients were approached for the study, 4 declined while 4 responses were incomplete and, thus, not included in the final analysis.

A total of 40 respondents were analyzed to evaluate the validation of the PTSD Checklist for DSM-5 (PCL-5) against the Mini International Neuropsychiatric Interview (MINI), which served as the gold standard for the diagnosis of post-traumatic stress disorder (PTSD).

3.1. Socio-Demographic Characteristics

The mean age of the respondents was 34.6 ± 10.6 years, indicating a relatively wide age distribution. The majority of the participants were male, while a smaller proportion were female. This is shown in **Table 1**.

Table 1. Age and sex of respondents (N = 40).

Variable	Frequency (n)	Percentage (%)
Age Group (years)		
<30	14	35.0
30 - 39	15	37.5
40 - 49	7	17.5
≥ 50	4	10.0
<i>Mean age $\pm$ SD</i>	34.6 ± 10.6	
Sex		
Female	7	17.5
Male	33	82.5

3.2. Prevalence of PTSD

Based on the MINI, 12 respondents (30.0%) were diagnosed with PTSD, while 28 respondents (70.0%) did not meet the diagnostic criteria. Using the PCL-5 with a cutoff score of 33, 11 respondents (27.5%) were classified as having PTSD, while 29 (72.5%) were classified as not having PTSD. This is shown in **Table 2**.

Table 2. Cross-tabulation of PCL-5 and MINI Diagnosis.

Variable	MINI Classification		Total
	Positive	Negative	
PCL-5 Classification			
Positive	9	2	11
Negative	3	26	29
Total	12	28	40

3.3. Diagnostic Classification Outcomes

The cross-tabulation shows that there were 9 true positives (TP), 26 true negatives (TN), 2 false positives (FP), and 3 false negatives (FN). These values formed the basis for calculating diagnostic performance indicators (Table 3).

Table 3. Diagnostic accuracy of PCL-5.

Indicator	Formula	Value (%)	95% CI
Sensitivity	$TP/(TP + FN)$	75.0	42.8% - 94.5%
Specificity	$TN/(TN + FP)$	92.9	76.5% - 99.1%
PPV	$TP/(TP + FP)$	81.8	48.2% - 97.7%
NPV	$TN/(TN + FN)$	89.7	72.6% - 97.8%
Accuracy	$(TP + TN)/Total$	87.5	73.2% - 95.8%

3.4. Interpretation of Diagnostic Indicators

The sensitivity of 75.0% indicates that the PCL-5 correctly identified three-quarters of respondents with PTSD as confirmed by the MINI. This suggests that while the tool performs reasonably well in detecting PTSD cases, some cases may still be missed.

The specificity of 92.9% demonstrates that the PCL-5 is highly effective in correctly identifying individuals who do not have PTSD. This high specificity indicates a low rate of false positives.

The positive predictive value (81.8%) indicates that a large proportion of respondents identified as having PTSD by the PCL-5 were confirmed by the MINI. The negative predictive value (89.7%) further shows that individuals classified as negative are very likely to be truly free of PTSD.

The overall diagnostic accuracy of 87.5% reflects a strong agreement between the PCL-5 and the MINI.

3.5. ROC Curve Analysis

As shown in Figure 1, the Receiver Operating Characteristic (ROC) curve was

used to assess the diagnostic ability of the PCL-5 across different thresholds. The area under the curve (AUC) was 0.911, indicating excellent discrimination between PTSD and non-PTSD cases.

An AUC of 0.911 (95%CI = 0.819 - 1.000, $p < 0.001$) suggests that there is a 91.1% probability that a randomly selected individual with PTSD will have a higher PCL-5 score than a randomly selected individual without PTSD.

3.6. Kappa Agreement Analysis

The agreement between the PTSD Checklist for DSM-5 (PCL-5) and the Mini International Neuropsychiatric Interview (MINI) was assessed using Cohen's kappa statistic (**Table 4**).

A kappa value of 0.695 was obtained, indicating substantial agreement beyond chance between the two instruments.

This suggests that the PCL-5 produces results that are largely consistent with the MINI in identifying post-traumatic stress disorder among respondents.

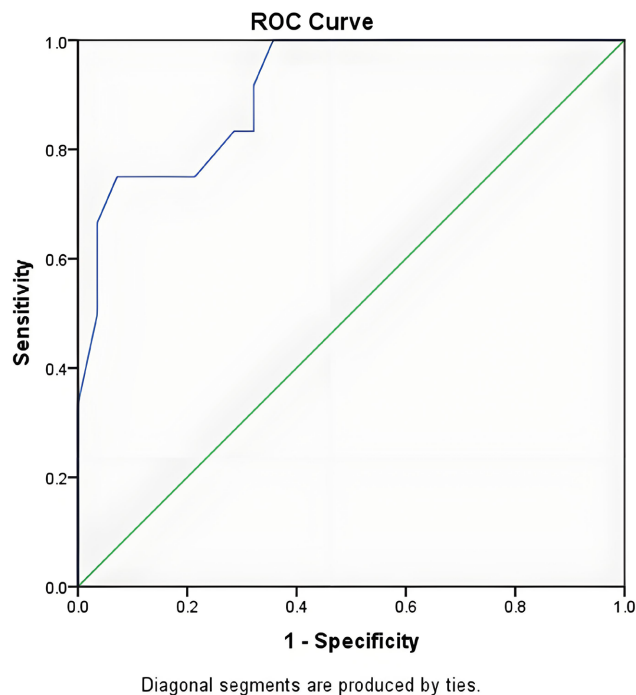


Figure 1. Diagonal segments are proceduced by ties.

Table 4. Agreement between PCL-5 and MINI.

Measure	Value	95% CI
Cohen's Kappa (κ)	0.695	0.448 - 0.942

3.7. Reliability Analysis

The PCL-5 demonstrated excellent internal consistency among the study participants (Cronbach's $\alpha = 0.917$, 95% CI: 0.875 - 0.950) (**Table 5**).

Table 5. Reliability analysis of the PCL-5.

Reliability Measure	Estimate	95% Confidence Interval
Cronbach's alpha	0.917	0.875 - 0.950

4. Discussion

The study set out to evaluate the diagnostic validity and reliability of the PTSD Checklist for DSM-5 (PCL-5) among RTA victims, using the MINI (Mini International Neuropsychiatric Interview) as the gold standard. It is the most current DSM-5 based PTSD measure and this is the first effort aimed at validating the instrument in Nigeria.

Findings from this study demonstrated that the PCL-5 has good diagnostic performance, with a sensitivity of 75%, high specificity of 92.9%, and an overall accuracy of 87.5% at a prespecified cut-off point of ≥ 33 . This is supported by high positive and negative predictive values of 81.8% and 89.7% respectively, reflecting a strong agreement between MINI and PCL-5.

The Area Under the Receiver Operating Characteristic (ROC) curve was found to be 0.91, indicating excellent discriminative ability of the instrument. These findings are in keeping with the findings from the only PCL-5 validation study carried out in Africa so far, in which the sensitivity and specificity of the tool were found to be 74.5% and 70.6% respectively, and the ROC gave an Area Under the Curve (AUC) of 0.78 [5]. This latter study was carried out among a primary care population with high HIV prevalence and a Clinician Administered PTSD Scale (CAPS-5) was used as the gold standard. Similarly, findings from this study are consistent with those from PCL-5 validation studies done in Western countries [2]-[4] [21] as well as that done in Brazil [22]. In addition, a PCL-5 study carried out among Filipino female migrant workers, using MINI as gold standard unlike the aforementioned studies but like this study, demonstrated that the PCL-5 is a reliable and valid screening instrument with diagnosis accuracy of 87% at cut off score of 25 [23]. As regards internal consistency, like in previous studies done in Zimbabwe [5] and Europe [2]-[4] and Phillipine [23], PCL-5 showed excellent Cronbach's alpha value in this study, confirming its reliability in this population.

Also, a Kappa value of 0.695 obtained in this study indicated that the PCL-5 results were largely consistent with MINI in identifying post-traumatic stress disorder among the respondents.

PTSD prevalence rate of 30% found in this study is comparable with prevalence rates found in previous studies involving RTA survivors; Mosaku *et al.* [17]. And Itেকে *et al.* [19] reported 33.7% and 26.7% respectively among their subjects. However, this rate is lower than the prevalence rates reported by Ajibade *et al.* (51.1%) [24] and Asuquo *et al.* (41.3%) [18]. This variation in rates is not unexpected because the rate of PTSD among survivors following RTA is affected by factors such as the severity of the injuries as well as the time interval between when the accident occurred and when the study is conducted. For instance, Ehlers *et al.* in their pro-

spective longitudinal study involving RTA survivors found PTSD prevalence rates of 23.1% and 16.5% at 3 months and 1 year after a motor vehicle accident respectively [25]. Similarly, Ursano *et al.* reported PTSD rates of 34.4%, 25.2% and 18.2% at 1 month, 3 months and 6 months respectively in their longitudinal study among motor vehicle accident victims [26].

Given the high prevalence of PTSD (30%) found among the subjects in this study, the strong association between being involved in RTA and occurrence of PTSD is further buttressed. Thus, including screening for PTSD among RTA survivors may not be out of place especially in a country like Nigeria where RTA is common as a result of bad roads and proliferation of use of motorcycles as means of commercial transportation on major roads.

Lastly, the present study has provided evidence to support the diagnostic validity and reliability of the PCL-5, therefore, it is a valid and reliable useful instrument for screening patients for further assessment for a possible PTSD diagnosis in Nigeria.

Limitations

This study has some limitations. Firstly, the sample size was too small and may not be representative. This was due to the number of patients who sought care at the hospital and met the study criteria during the study period. Secondly, it was carried out in one institution, so it may be difficult to generalize its findings. There is need to carry out similar study in other tertiary hospitals. Also, it was observed that the prevalence rate of PTSD as detected by PCL-5 in this study was lower than that of the MINI which is unexpected since PCL-5 is a screening instrument. This finding suggests that cut-off score of 33 used in this study may be too high in this population. Lastly, it was observed that the proportion of female participants in this study was too low compared to their male counterpart, this could be explained by the fact that males are more active and more likely to be involved in risky behaviors while driving which may result in RTA.

5. Conclusion

Overall, these findings indicate that the PCL-5 is a valid and reliable screening tool for the identification of post-traumatic stress disorder among road traffic accident victims. However, the presence of some false negative cases suggests that while the tool is effective for screening, it should not replace structured clinical interviews such as the MINI for definitive diagnosis.

Author Contributions

M.A.L., O.D.O. and S.A.A. conceptualized and designed the study. M.A.L. prepared the draft manuscript. S.K.M. reviewed and provided critical and intellectual comments on the draft while F.A.A. and J.A.A. contributed to data collection and final preparation of the manuscript. All authors read and agreed to the published version of the manuscript.

Conflicts of Interest

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

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