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Prevalence And Correlates Of Post-traumatic Stress Disorders (PTSD) Among The Military In A Low-income Country

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ORIGINAL STUDY

Prevalence and Correlates of Post-Traumatic Stress Disorders (PTSD) among the Military in a Low Income Country

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Abstract

Background: **This study investigated the prevalence and correlates of post-traumatic stress disorder (PTSD) and its risks among the military in a low-income country.**

Method: **All participants answered self-administered questionnaires that measured PTSD, combat exposure, musculoskeletal disorders (MSDs), perceived social support, and depression in addition to a socio-demographic form in this cross-sectional study. Chi-square test of independence and Fisher exact test were employed to compute PTSD prevalence and its difference among the services. Correlation and binary logistic regression were used to explore relationships and the impact of the predictor variables on PTSD.**

Results: **PTSD prevalence among participants on routine military duties was 12.2%. PTSD was significantly related to MSDs (Army, $p = 0.03$; Navy, $p = 0.008$; Air Force $p = 0.039$), combat exposure and depression ($r = 0.36$, $p = 0.001$), but not with gender (Army $p = 0.683$, Navy $p = 0.448$ and Air Force $p = 0.586$), perceived support ($r = -0.05$, $p = 0.476$) and years of service ($r = 0.05$, $p = 0.407$). Rank was only significantly associated with PTSD in the Army ($p = 0.023$) and Air force (0.015). Combat exposure was the best predictor of PTSD with an odds ratio of 1.21.**

Conclusion: **This study provided evidence about the presence of PTSD among military personnel from a low-income country who were exposed to insurgency and terrorism. It revealed valuable information on the correlates of PTSD among the military personnel. This information can enhance the military's operational effectiveness and influence the formulation of policies regarding PTSD by the Appropriate Superior Authorities (ASA) of the military.**

Keywords: Post-traumatic stress disorders, Stress disorder, Post-traumatic, Military

1. Introduction

Nigeria is rated as one of the most vulnerable countries at risk of post-traumatic stress disorder (PTSD) [1]. Post-traumatic stress disorder (PTSD) is a complex and chronic disorder caused by exposure to a traumatic event. PTSD is a common psychological condition among the military [2]. PTSD causes substantial distress and interferes with morale, physical fitness, personal and social functioning of troops. It has a subsequent pervasive impact on military readiness and the accomplishment of military goals [2].

According to a cross-national study comprising of Nigeria among the other 23 countries, the lifetime prevalence of PTSD in the general population was 0.6% [1]. However, combat-related PTSD prevalence from a recent meta-analysis ranges from 1.09% to 34.84% [2]. Among Hawaiian Vietnam War veterans, lifetime PTSD and current PTSD was 30.6% and 14.7% respectively [3]. In a survey of Gulf War era veterans and their families, the PTSD prevalence was 12.1% [4]. A study of the United States (US) military revealed significantly higher prevalence of PTSD after duty in Iraq (12.2%−19.9%) compared to PTSD after duty in Afghanistan (11.2%) [5]. In Nigeria, researchers reported the prevalence rate for PTSD among Nigerian soldiers involved in peace-keeping missions in Sierra Leone and Liberia, who were admitted to an army hospital in Lagos, was 22%, [6].

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Recently, Nigerian military personnel have been exposed to higher levels of trauma from their combat-intensive deployment in various parts of Nigeria and in other foreign missions. Despite these conditions, very few studies have assessed the mental health consequences of these traumatic experiences on military personnel [6,7]. The said studies cannot account for the recent traumatic exposures among the Nigerian armed forces.

While numerous studies have been conducted about combat-related PTSD across the globe, there is a dearth of such studies among the armed forces of low-income countries such as Nigeria. While previous studies have evaluated PTSD in the Army, the Armed Forces as a population, which also includes the Navy and Air Force, is yet to be studied. Also, studies done were evaluations of the past combat exposures, not the current insurgency. To date, to the best of our knowledge, no study has investigated the prevalence of PTSD among the three arms of the military service (Army, Navy, and Air Force) in Nigeria. There was, therefore, the need for more studies on PTSD in low-income countries, especially among the military population. This research will help formulate plans, gazettes, and policies for effective military operations.

2. Methodology

2.1. Study design and participants

We conducted a descriptive cross-sectional survey to assess the prevalence of post-traumatic stress disorder and its correlates among the Armed Forces in a low-income country. Data was collected from personnel serving at an Air Force Base, an Armed Forces Specialist Hospital, a Brigade, an Armed Forces and a Staff College, Defense Academy, and one Barrack. Specific names of participating military establishments were not included to maintain anonymity for ethical reasons. Only serving military personnel who were not undergoing military trial, under punishment, in operations, nor on the course were included in this study. A minimum sample size of 264 was calculated using the Kish formula [$n = Z^2 P (1-P)/d^2$] for estimating the sample size for a cross-sectional study [8]. For this sample size calculation, we used the estimate of prevalence (P = 22%) of PTSD among the country's participating soldiers. Z_α and d were set at1.96 and 5%, respectively [6]. Adjustment of the original sample size (n) for a 10% non-response rate (r) was done using the formula: Adjusted sample size (N) = nr/r-1 yielded an adjusted sample size of 294. Thus, a sample size of 300 was used for this study. We used multi-stage sampling to recruit study participants. The purposive sampling technique was utilized to select a military formation/location where service members from the three branches of the Armed Forces were accessible. Consecutive sampling was then used to select participants from the Army, Navy, and Air Force. A total of 300 participants were surveyed in this study, with 100 participants each from the Army, Navy, and Air Force. The purpose and procedure of the study were explained to personnel and their consent was obtained. Participants willing to participate in the study were screened for inclusion into the study. Thereafter, participants were asked to complete the study questionnaires which comprised of Post-traumatic Stress Disorder Checklist-Military Version (PCL-M version), Nordic Musculoskeletal questionnaire (NMQ), Combat Exposure Scale (CES), Multidimensional Scale of Perceived Social Support (MSPSS), and Beck Depression Inventory (BDI). A total of 271 questionnaires were returned, resulting in an excellent response rate of 90.3%. The data for this study were collected between April and May 2018.

2.2. Ethical considerations

This study obtained human subjects' approval from an Armed Forces Specialist Hospital (AFSHK/G3/230/03).

2.3. Measures

2.3.1. Post-traumatic stress disorder

To assess post-traumatic stress disorder, we used the Post-traumatic Stress Disorder Checklist-Military Version (PCL-M), a 17-item self-report checklist [9,10]. The items are rated on a 5-point Likert scale reflecting the severity of symptoms ranging from "not at all" (1) to "extremely" (5). PCL-M scores ranged from 17 to 85 with a cutoff score of 50 points used to identify PTSD [10]. This cutoff score has first-rate sensitivity and specificity of 0.82 and 0.83, respectively and a Ḱ = 0.64 [11]. The PCL-M has proven to be a psychometrically sound instrument for screening PTSD [12]. The test-retest reliability was 0.96, $\alpha = 0.93$ for Criteria B symptoms, $\alpha = 0.92$ for Criteria C symptoms, $\alpha = 0.92$ for Criteria D symptoms, with an overall $\alpha = 0.97$ for all items [11,13]. PCL-M has a test-retest reliability of 0.7 [12].

2.3.2. Combat exposure

Combat exposure was measured using the Combat Exposure Scale (CES) which is a 7-item, 5-point Likert self-rating scale that is widely used to assess

the level of combat trauma experienced by veterans [14]. This scale showed high-quality internal consistency and reliability in a previous research study of combat-related PTSD [14]. Participants rated items on a 5-point Likert scale. The answers (raw scores) from participant responses to the Combat Exposure Scale were then converted into a total CES score using a combat exposure scale scoring sheet.

2.3.3. Musculoskeletal disorders

Musculoskeletal disorders were assessed using the Nordic Musculoskeletal Questionnaire (NMQ). It is a 27-question instrument that is reliable in assessing the prevalence, severity, and impact of musculoskeletal symptoms [15]. This instrument assesses the presence of ache, pain, or discomfort during the last 12 months and last 7 days and the effect of these symptoms on normal daily activities during the last 12 months in nine (9) major body parts [16]. The questionnaire is a valid and reliable questionnaire for musculoskeletal pain assessment in different body regions [15,16]. The body parts included the neck, shoulder (right, left or both), elbow (right, left or both), wrists/hands (right, left or both), upper back, lower back, hip/buttocks (one or both), knee (one or both) and ankle and/foot (one or both). It has a strong test-retest reliability and criterion validity of 0.92 and 0.76, respectively [15].

2.3.4. Depression symptoms and severity

Depression symptoms and severity of participants were collected using a 21-item self-report checklist called the Beck Depression Inventory. The checklist was rated on a 4-point Likert scale. Beck Depression Inventory (BDI) is a 21-item self-report checklist that is one of the most popular measures of depression symptoms and severity in people aged 13 years and above [17]. The items are rated on a 4-point Likert scale reflecting the severity of symptoms ranging from 0 to 3. The BDI has proven to be a psychometrically sound instrument for measuring depression symptoms and severity. The internal consistency was described as about 0.9 and the retest reliability ranged from 0.73 to 0.96 [17]. The total score for each participant was calculated.

2.3.5. Perceived social support

Perceived Social support was determined using a multi-dimensional scale of perceived social support. This scale was assessed using a 12-items questionnaire rated on a 7-point Likert scale. The total score for each participant was calculated. Then, the mean scores were computed.

2.3.6. Data analysis

The data collected was analyzed using Statistical Package for Social Sciences (SPSS), version 27. Descriptive statistics, including frequencies and percentages, were used to summarize the socio-demographic characteristics of the participants. The point prevalence of PTSD among the Nigerian Armed Forces and the individual arms of service were computed using percentages. A 3×2 contingency table was employed to compare the prevalence among the three services.

Following evidence of a linear relationship from the scatter plots, the relationship between the dependent variables (post-traumatic stress disorders) and the predictor variables (combat exposure, depression, social support, and level of education) were explored using Spearman's rank correlation coefficient (rho). We investigated the correlation statistics as a result of the non-normality of the dependent variable. We performed Fisher's exact test to investigate the associations between categorical variables (MSD, rank & gender) and the outcome variable.

We utilized binary logistic regression to determine the predictability of the independent variable. A sequential method of entering variables was used to assess the contribution of variables in the models generated. Model improvement with each addition of predictor variables, percentage accuracy of each model, p-value, standard error, and odds ratio was used in assessing the models. Furthermore, model fitness to the data was explored using the Hosmer and Lemeshow goodness-of-fit test. The model with the highest overall percentage correctness was said to be reliable, and at the same time was then chosen to analyze the data.

3. Results

Of the 300 questionnaires distributed to participants, 271 questionnaires were returned, resulting in a response rate of 90.3%. The majority of the participants were male (84.1%) and married (65.8%). A minority of participants were commissioned officers (10%). While younger soldiers made up 56.9% of the participants, the participants' educational level ranged between secondary school and postgraduate; 30.1% had a secondary certificate, 36.4% had a post-secondary certificate, bachelor's degree and postgraduate holders were 29.4% and 4.1%, respectively. Participants that were male, single, young, non-commissioned, and those with a low level of education had higher PTSD prevalence than their other counterparts (Table 1).

Table 1. Socio-demographic characteristic and prevalence of PTSD.

Variables	Total	Proportion with PTSD
	N (%)	N (%)
Gender		
Male	228 (84.1%)	31 (13.6%)
Female	43 (15.9%)	2 (4.7%)
Age category		
Younger (18–34)	153 (56.0%)	21 (13.7%)
Older (35–60)	116 (43.1%)	12 (10.3%)
Marital status		
Single	92 (34.2%)	8 (8.7%)
Married	177 (65.8%)	25 (12.3%)
Type of commission		
Commissioned officers	40 (14.8%)	10 (25.0%)
Non-commissioned officers	231 (85.2%)	23 (10.0%)
Level of Education		
Secondary	81 (30.1%)	11 (13.6%)
Post-secondary	98 (36.4%)	8 (8.2%)
Bachelor's Degree	79 (29.4%)	12 (15.2%)
Postgraduate	11 (4.1%)	2 (18.2%)
Musculoskeletal disorders		
Yes	175 (64.6%)	32 (18.3%)
No	96 (35.4%)	1 (1.0%)

The prevalence rates of PTSD were higher among the Army (41.4%) and the Navy (14.8%) while that of the Air Force was low (7.5%). The overall prevalence rate of PTSD was 12.2% among participants, which we considered high (Table 2).

The result of an exact Chi-square test shows that the difference in PTSD prevalence among the three different service arms was not significant ($x^2 = 0.234$, df = 1, p = 0.564, Table 3).

The Post-traumatic Stress Disorder Checklist (PCL) scores were found to be significantly related to combat exposure [(r = .47, p < 0.001) and (r = .23, p = .031)] and depression score [(r = .29, p = .007) and (r = .24 [16], p = .027)] amongst the Army and Air force (Table 4). The outcome variable was also significantly related to social support in the army. However, in the Navy only combat exposure was significantly related to PCL score (r = .41, p < 0.001). Looking at the whole military personnel in total, the PCL score was not significantly related to all the variables except combat exposure which was moderately related (r = .364, p < 0.001) and depression score that was also moderately related (r = .364, p < 0.001), Table 4. These relationships were all positive which indicates that as combat exposure and depression score increases, so does PCL score.

Binary logistic regression indicates that combat exposure and depression were significant predictors of PTSD (Chi-Square = 86.423, df = 4 and p < 0.001). On the contrary, social support and BMI were not significant predictors of PTSD. The significant predictors together "explained" 56.2% of the variability of the dependent variable [Nagelkerke R Square = 0.562 (Table 5)]. Combat exposure and depression were significant at the 5% level [combat exposure: Wald = 19.086, p < 0.05; depression: Wald = 14.58, p < 0.05]. The odds ratio (OR) for CES was 1.207 (95% CI: 1.11–1.31) and for depression, the OR was 1.18 (95% CI: 1.08–1.28).

Musculoskeletal disorder was associated with PTSD in all arms of the Nigerian military. The p-values for the Fisher exact test for Army, Navy and Air Force were 0.03, 0.008, and 0.039, respectively (Table 6). The Fisher exact tests for association between gender and PTSD in the three services were all not statistically significant. In the Army and Air Force, rank was associated with PTSD (p = 0.023 & p = 0.015), but not in the Navy (p = 1.0).

Table 2. Prevalence of PTSD in each service arm.

Arm of service	PTSD diagnosis		Total
	No	Yes	
Army	77	13	90
	85.6%	14.4%	100.0%
Navy	75	13	88
	85.2%	14.8%	100.0%
Air Force	86	7	93
	92.5%	7.5%	100.0%
Total	238	33	271
	87.8%	12.2%	100.0%

Table 3. Difference in the PTSD prevalence among the three service arms.

	Pearson Chi-Square Value	Df	p-value
Arm of service	2.868[a]	2	0.238
N of Valid Cases	271		

[a] 0 cells (0%) have an expected count less than 5.

4. Discussion

This study determined the prevalence of PTSD among the military of a low-income country whose personnel were on normal military duties. We found that the prevalence rate of PTSD (12.2%) was high among the military in Nigeria. We hypothesize that this prevalence was quite high because the fight of the Nigerian military against the insurgents was at its peak. Though there were not statistically significant differences among the three arms of service, the prevalence of PTSD prevalence among the Army and the Navy (14.4% and 14.8%, respectively) was to some extent higher than that in the Air Force (7.5%). This was not surprising as each arm of the military was actively involved in the fight against insurgency at different capacities.

This study also showed that males had a higher PTSD proportion than females in the military.

Table 4. Correlation relationships among post-traumatic stress disorder (PTSD) and possible predictors in the three-arm of services.

Post-traumatic Stress Disorder Checklist (PCL) Score								
	Army R	p-value	Navy R	p-value	Airforce R	p-value	Total	p-value
PCL	1.00		1.00		1.00		1.00	
Age	.19	.085	-.04	.750	.11	.311	.08	.18
BMI	-.04	.724	-.12	.285	.08	.462	-.02	.79
Yrsvc	.12	.282	-.10	.401	.13	.252	.05	.407
CES	.47**	.000	.41**	.001	.23*	.031	.36**	<.001
PSS	-.32*	.003	.13	.228	.07	.499	-.05	.476
BDS	.29*	.007	.21	.060	.24*	.027	.23**	.000

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).
Abbreviations: Yrsvc − Years of service; BMI − Body mass index; PCL − Posttraumatic stress checklist scores; CES − Combat exposure scores; PSS − Perceived social support; BDS − Beck depression scores.

Table 5. Logistic regression results for association of predictor variables with post-traumatic stress disorder (PTSD) scores.

	Beta	S.E.	Wald	df	p-value	Exp (Beta)	95% CI for Exp (Beta)		Nagalkerke R Square
							Lower	Upper	
CES	0.188	0.043	19.358	1	0.001	1.206	1.110	1.311	0.564
BMI	−0.063	0.154	0.168	1	0.682	0.939	0.694	1.269	
BDS	0.162	0.042	15.016	1	0.001	1.175	1.083	1.276	
PSS	−0.010	0.020	0.244	1	0.621	0.990	0.951	1.030	

Abbreviations: BMI − Body mass index, CES − Combat exposure scores, PSS − Perceived social support.
BDS − Beck depression scores.

Table 6. Association between PTSD score with gender, rank, and musculoskeletal disorders (MSDs) using fisher's exact test.

	Fisher's Exact test (2-sided p-value)		
	Army	Navy	Air force
Gender	0.683[a]	0.448[a]	0.586[a]
Rank	0.023[a]	1.00[a]	0.015[a]
Musculoskeletal disorders	0.030[a]	0.008[a]	0.039[b]

[a] 1 cell (25.0%) has an expected count of less than 5.
[b] 2 cells (50.0%) have an expected count of less than 5. The minimum expected count is 2.86.

Though this difference was not statistically significant. Our finding that gender was not related to PTSD in all the three services concurred with the findings of a previous study that reported no significant gender differences in the possibility of developing PTSD [18]. This is probably because of the nature of the military services that men or women are exposed to. In the low-income country that we studied, Nigeria, men are more likely to be in combat than women since there were more men in service than women. Our finding contrasted with an earlier finding found that more traumatic combat exposures were associated with higher PTSD risk for servicewomen compared to servicemen. We hypothesize that this study probably had a higher or equal number of women in service [19]. Another study reported that gender influenced the prevalence of PTSD among victims of road traffic accidents (RTAs). In RTAs, females were more likely to experience PTSD when compared to males [20]. Perhaps, the dissimilarity between the races and populations of our study with the cited study could explain the disparity. Also, other factors that might influence gender's association with PTSD prevalence include ethnicity, culture, and social support of individuals. Furthermore, it was reported that PTSD was significantly and positively associated with loss of job activity due to the accident [21]. Thus, it can be inferred that employment and socio-economic status might play key roles in influencing PTSD prevalence.

Furthermore, this study shows that there was a significant association between rank and PTSD in both Army and the Air Force, but not in the Navy. The findings in the Army and Air Force were consistent with what has been reported in a previous study that showed that military serving in lower ranks had higher PTSD prevalence [2]. On the other hand, our finding of the lack of association between rank and PTSD in the Navy could perhaps be explained by the differences in nature, pattern, mode, and the terrain of their operations. While in the Army, the junior service members are more prone to be exposed to combat exposure than the senior members. But in the Navy, both commissioned and non-commissioned members are often exposed to almost the same combat dangers as they are always on board together irrespective of their

commission or rank. This suggests that the association between PTSD and rank reported by previous studies may be a result of confounding due to combat exposure.

Contrary to a study of the US military which reported that PTSD was more common in less educated Army personnel than their counterparts [2], we found that level of education was not significantly related to PTSD among Armed Forces members in Nigeria. The reason for this finding might be because the majority of the studied personnel are not officers. Therefore, they are more likely to have school leaving certificates. Furthermore, this may be because of differences in employment and promotion policies that determine job engagements between the United States and Nigeria. Unlike the situation in high-income countries, equal opportunities given to the officers for educational development have little or no influence on the change of cadre, which later determines job specification and exposure. Typically, the initial entry of personnel as either commissioned or non-commissioned usually justifies the end, even though both can be allowed to attain the highest level of education in their specialty. In essence, acquiring more qualifications either as commissioned or non-commissioned officers do not positively affect military career progression. In contrast, in other paramilitary outfits, increasing qualifications generally leads to career advancement. This was clear in this study as the associations between level of education and type of commission were not statistically significant in each of the arms.

The outcome of this study also showed that the combat exposure scale (CES) and depression correlate significantly with the outcome (PTSD) in all the three services. These findings are in line with the study of Connell, Omole, Subramaney, and Olorunju [22], which found that PTSD was significantly associated with combat exposure ($p = 0.012$). Among the two significant predictors (CES and depression), CES was the better predictor of PTSD than depression with a prediction rate of 1.21 and 1.18, respectively. Therefore, the service needs to ensure that the rate of combat exposure of servicemen and women is reduced as much as possible.

Our study further showed that musculoskeletal disorders were associated with PTSD in all three arms of the military. This is similar to what was reported earlier that MSDs are related to PTSD among 50 active-duty military personnel in the United States military [23]. Also, Australian military personnel with musculoskeletal pain disorders were reported to be at an increased risk of PTSD [11]. Our study supports that post-traumatic stress disorder is common among individuals with chronic pain conditions [24]. Other studies have documented prior trauma, especially traumatic brain injury (TBI), as a strong predictor of PTSD among the military [24]. It is thus, suggested that personnel with a persistent musculoskeletal disorder should be screened and managed for PTSD and vice versa.

This study showed that younger soldiers had a higher PTSD prevalence than their older counterparts. However, the difference was not statistically significant. This finding supports what Saleh and colleagues documented in 2016 [25] that older soldiers did not have a significantly higher score on PTSD than younger soldiers irrespective of missions they attended. This is probably because the older soldiers have more experience and have developed coping strategies over the years. Therefore, there is a need for the older soldiers who have ample experience to share their experience with the younger ones and coach them on much need coping strategies. However, there is still a controversy about whether age matters concerning the prevalence of PTSD. A meta-analysis conducted to study the influence of age as a risk factor for combat-related PTSD suggested that younger age at the time of trauma is largely unrelated to PTSD [2]. In contrast, some studies pointed out younger age is a strong risk factor for PTSD [2,26] This is not surprising since PTSD was found to be severely collinear with the length of service, which in turn reflects a level of exposure to trauma.

5. Strengths and limitations

A strength of our study was that we had a high response rate of 90.3% among military members. This is commendable considering that the military often has reduced response rates due to practical difficulties in finding people or participant inertia [21]. To our knowledge, our study is the first one to examine prevalence of PTSD and its correlates in all the three service arms that made up the armed forces of Nigeria. Another strength of this study is that, while most studies examined populations at higher risk (personnel attending clinics among others), this cross-sectional study investigated personnel on normal military duties. However, one major limitation of this study is its inability to explain causality because it was a cross-sectional study. There is potential recall bias in the data collected as most of the instruments used requires the participant to recall event and experience in the past. However, the instruments were valid and reliable. Also, the sample size was large enough to minimize this effect.

6. Conclusion

This study demonstrates the prevalence of PTSD was high among the serving military personnel in the studied low-income country, Nigeria. Also. Level of education of the respondents had no association with PTSD. The outcome of this study shows that CES and depression correlated significantly with the outcome (PTSD) in all three services. Musculoskeletal disorders were also associated with PTSD in all three services. The study provides valuable information on the prevalence of PTSD and its correlates among the military personnel of the studied low-income country, Nigeria. These results can be used to enhance their operational effectiveness and influence the formulating policies regarding PTSD from the Appropriate Superior Authorities (ASA) of the military.

Conflict of interest

We declare no conflict of interest.

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