Trauma Exposure, Posttraumatic Stress Disorderand the Effect of Explanatory Variables in Paramedic Trainees

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Abstract: **Background: Emergency healthcare workers, including trainees and individuals in related occupations are at heightened risk of developing posttraumatic stress disorder (PTSD) and depression owing to work-related stressors. We aimed to investigate the type, frequency, and severity of direct trauma exposure, posttraumatic stress symptoms and other psychopathology amongst paramedic trainees. In order to create a risk profile for individuals who are at higher occupational risk of developing PTSD, we examined risk and resilience factors that possibly contributed to the presence and severity of posttraumatic symptomatology.**

Methods: Paramedic trainees (n = 131) were recruited from a local university. A logistic regression analysis was conducted using the explanatory variables age, gender, population group, trauma exposure, depression, alcohol abuse, alcohol dependence, resilience and social support.

Results: 94% of paramedic trainees had directly experienced trauma, with 16% meeting PTSD criteria. A high rate of depression (28%), alcohol abuse (23%) and chronic perceived stress (7%) and low levels of social support was found. The number of previous trauma exposures, depression, resilience and social support significantly predicted PTSD status and depression had a mediating effect.

Conclusion: There is a need for efficient, ongoing screening of depressive and PTSD symptomatology in trauma exposed high risk groups so that early psychological supportive interventions can be offered.

Keywords: **Trauma, Posttraumatic stress disorder, Paramedic trainees, Emergency medical workers.**

I. INTRODUCTION

Background

Emergency Care Workers (ECW), for example police officers, fire fighters, rescue and disaster workers, military personnel and ambulance personnel, are at a higher occupational risk of developing posttraumatic stress disorder (PTSD) owing to their repeated exposure to critical incidents [1-5].

Critical incidents are events involving death, life-threatening injury or a crisis situation with a need for rescue or emergency that may result in stress-related reactions and the development of PTSD [6,7]. ECW trainees may be at an even higher risk of developing PTSD due to exposure to a novel environment, age, inexperience in the field and the added pressure of aca- demic evaluation [8].

However, few studies have investigated the prevalence and risk factors for PTSD in ECW trainees. A South African study that investigated the relationship between exposure to critical incidents and prevalence of mental health problems among emergency medical care personnel (including traffic police, fire services, ambulance staff, and sea and air rescue workers) found that symptoms of anxiety, depression or PTSD intensified when exposure to critical incidents increased [9].

However, the rate at which symptoms increased eventually slowed over time, suggesting that there may be a time dependent desensitization to the effects of repeated work-related traumatic exposures. For example, in a UK study, re- searchers found that 10% of the 574 emergency medical care workers included in their study were suffering from clinical levels of depression and 22% met PTSD criteria [10].

For example, one study found that 16% of emergency personnel present at the scene of a tragic aeroplane crash were diagnosed with depression seven months after the incident [11].

Several mitigating factors for PTSD in emergency workers and trainees have been identified. For example, social support following a traumatic incident has been found to be protective against PTSD [8,13,14]. In one study, ECW who reported strong peer support also re- ported lower levels of perceived stress [15]. Similarly, a Dutch study found that lack of social support from supervisors greatly compounded symptoms of burnout in ambulance personnel [16].ECW workers are frequently unaware of the specifics of the emergency situation as they are often the first personnel on site and consequently do not have adequate time or information to mentally pre- pare themselves. Due to the nature of their work, ECW face an increased risk of developing PTSD symptoms.

The purpose of this study was firstly to assess and determine the frequency, nature and severity of direct trauma exposure, posttraumatic stress symptoms and other psychopathology amongst paramedic trainees. Secondly, the study aimed to identify risk factors (e. trauma exposure) and resilience factors (e. social support) that contribute to the presence and severity of posttraumatic symptomatology amongst paramedic trainees.

Thirdly, the study aimed to create a risk profile for paramedic trainees who are at higher occupational risk of developing PTSD.

II. METHODS

All the participants were first year paramedic trainees. Participants were assessed with a battery of questionnaires including a demographic questionnaire as well as several measures of psychiatric and psychological status.

If two or more significant traumatic Trauma exposure was measured using the Life Events Checklist (LEC), a questionnaire from the Clinician- Administered PTSD Scale for DSM-IV (CAPS) [19]. This scale assesses the direct and vicarious experience of various traumatic events, and it has demonstrated ad- equate psychometric properties [19].

A total score can be computed to reflect the number of different incidences are recorded, the participant is required to identify the one that is most severe. The Davidson Trauma Scale (DTS) assesses the frequency and severity of PTSD symptoms according to PTSD criteria in the DSM-IV-TR, and has been used as a symptom status measure in various populations [20]. The questionnaire consists of 17 items, measured on a scale of $0 – 4$ for frequency as well as severity.

A cut-off score of 40 is considered to indicate the presence of PTSD. The DTS has shown good test-retest reliability ($r = 0. 86$) and internal consistency ($r = 0. 99$), as well as good validity.

The CES-D has a 5-point Likert scale. The scale has very good reliability, with a Cronbach's alpha value of 0.85 in the general population and 0. 90 in a psychiatric population [22]. In a South African study, to examine cross-cultural relevance, a Cronbach's α of 0. 90 was found [23]. Alcohol Use Disorders Identification Test (AUDIT) The Alcohol Use Disorders Identification Test (AUDIT) was used to identify participants with problematic alcohol use. It consists of 10 items relating to alcohol usage and responses are rated on a 5-point Likert scale. A score of 8 or higher indicates possible alcohol abuse. This scale has shown good reliability and validity, and has been tested in various cultures [24].

The Patient Health Questionnaire (PHQ-15) was used to assess participants' perceptions of their physical health. Responses are measured on a 3-point Likert scale. This 15- item questionnaire has a cut-off score of 15 or more for high symptom severity, and has displayed good internal re- liability with a Cronbach's alpha value of 0. 80 [25]. Perceived Stress Scale (PSS-10) The 10-item Perceived Stress Scale (PSS-10) was used to assess participants' perceptions of stress.

It is a 10-item questionnaire measured on a 4-point Likert scale and has good reliability and validity [26]. The PSS-10 measures the degree to which situations in one's life are appraised as stressful. The scale also includes a number of direct queries about current levels of experienced stress. The questionnaire consists of 12 items relating to sup- port from family,

friends, or a significant other, and is rated on a 7-point Likert scale. Connor-Davidson Resilience Scale (CD-RISC) The Connor-Davidson Resilience Scale (CD-RISC) is a 25-item questionnaire with each item scored on a 5-point Likert scale.

The scale measures resilience based on five factors: (1) personal competence, high standards and tenacity; (2) trust in one's own instincts, tolerance of negative affect and strengthening effects of stress; (3) social sup- port; (4) control and; (5) spiritual influences e. The scale has a range of 0–100, with higher scores reflecting greater resilience. It has good reliability (Cronbach's α = 0. 89) and strong validity [28].

Frequencies and score means were obtained for demographic variables, and reliability tests were conducted for each scale to obtain a Cronbach's alpha value [29]. distribution of the data was examined with Kolmogorov- Smirnov tests. Mann–Whitney U tests were conducted to assess for differences based on PTSD status, on variables of direct trauma exposure, depression, alcohol abuse, physical health symptoms, perceived stress, social support and resilience. Logistic regression models were used to determine the predictive value of demographic characteristics and mental health measures on PTSD status.

Gender, age, population group and level of exposure were entered into the first model, followed by the addition of depression, perceived stress and alcohol use or abuse in model 2 and the addition of perceived social support and resilience in model 3.

III.   RESULTS

Participants were mainly of White (47%) and Coloured (33%; the term Coloured is a demographic marker that historically denotes South Africans of African, European and/ or Asian ancestry) population groups and were predominantly male (64%). The mean age of participants were 22 (range: 17–39). The majority of participants were not married (92%). Kolmogorov-Smirnov tests were used to determine the nor- mality distribution of the data. The Kolmogorov-Smirnov tests were significant for the variables PTSD, depression, al- cohol abuse, physical health status, perceived stress and level of exposure indicating that the data for these variables were not normally distributed. Resilience was the only variable with a non-significant Kolmogorov-Smirnov stat- stic and therefore the only normally distributed variable. Mann–Whitney tests and logistic regression, methods not dependent on normal distribution, were therefore used to analyse the data.

Table 1: Demographic characteristics of the sample

	N	%	M
Gender	132		
Male	84	63.6	
Female	48	36.4	
Age	129*		22.05
	132		
Population group			
Black	18	13.6	
Coloured	44	33.3	
White	62	47.0	
Indian	5	3.8	
Other	1	0.8	

*missing data.

Cronbach's alpha for the DTS indicated excellent reli- ability (α = 0.96). Other scales also yielded excellent reli- ability: the CD-RISC (α = 0.92), the MSPSS (α = 0.93), CES-D (α = 0.91) and AUDIT (α = 0.87). The PSS-10 and the PHQ had alpha values of 0.75 and 0.78, respectively, which are regarded as acceptable [29].

Trauma exposure and PTSD status Among those with PTSD, the most endorsed trauma was witnessing a transport accident (n = 15, 65%). Mental health, physical health and PTSD status High prevalence rates were found for PTSD (16%), de- pression (28%), alcohol abuse (24%) and alcohol dependence (8%). Participants meeting PTSD criteria had significantly higher levels of trauma exposure $U(124) = 634.5$, $p = .003$, depression $U(122) = 188$, $p < .000$, per- ceived stress $U(122) = 439$, $p < .000$ and physical health symptoms $U(123) = 437$, $p < .000$ compared to participants who did not meet criteria for PTSD. Participants meeting PTSD criteria also had significantly lower levels of resilience $U(122) = 656.5$, $p = .012$ and social support $U(124) = 682$, $p = .008$. There was no significant differ- ence in alcohol abuse $U(124) = .154$, $p = .154$ scores be- tween participants meeting PTSD criteria and participants not meeting the criteria. The regression model included demographic variables and mental health variables, with PTSD status as the dependent variable. variables were entered into the first regression model: age, gender, population group and number of total previous trauma exposures. In model 2 alcohol abuse, alcohol dependence, perceived stress and depression where added to the demographic variables and trauma exposure in model 1. In model 1, with only the demographic vari- ables and trauma exposure included to assess their effects on PTSD status, only number of previous trauma exposures significantly predicted PTSD status ($\beta = .24$, $p = .003$, OR 1.27). In model 2, with the demographic variables, trauma exposure, perceived stress, depression and alcohol abuse/dependence, only depression significantly predicted PTSD status ($\beta = .21$, $p = .003$, OR 1.23) and number of previous trauma exposures was no longer a sig- nificant predictor ($\beta = .15$, $p = .184$, OR 1.16). In model 3, with the demographic variables, trauma exposure, per- ceived stress, depression, alcohol abuse/dependence and social support and resilience, depression ($\beta = .335$, $p = .002$, OR 1.40), social support ($\beta = -.74$, $p = .020$, OR .93) and resilience ($\beta = .114$, $p = .020$, OR 1.12) significantly predicted PTSD status.

IV. DISCUSSION

The main findings of this study can be summarized as follows: paramedic trainees had high rates of PTSD, de- pression and trauma exposure (based on self-reported symptoms). Participants meeting criteria for PTSD had significantly higher rates of depression, perceived stress and physical health symptoms and significantly lower rates of resilience and social support. Higher rates of trauma exposure and depression and lower rates of social support and resilience were significant predictors of PTSD. Depression had a mediating effect on the relationship between trauma exposure and PTSD. Paramedic trainees had high rates of trauma exposure, both related (e. witnessing a transport accident) and un- related (e. being a victim of physical assault) to work. childhood exposure to violence, abuse and neglect, may influence career choice among paramedics. A high rate (38. 4%) of physical, sexual and emotional abuse was found in a sample of Canadian veteran paramedics [30]. An asso- ciation between childhood abuse and neglect and higher mental and physical health symptom scores was also re- ported in that sample [30]. Together with the findings of our study, it suggests that exposure to early adversity may impact on the career choice of paramedics. 16% of paramedic trainees met symptom criteria for PTS.

The rate of current PTSD is considerably higher than the 12 month prevalence rate of 0. 6% among South Africans (based on lay administered structural interview) [31]. The rate of PTSD is consistent with that documented by a group of Dutch researchers (2003) who found that 12% of emergency workers displayed PTSD symptoms [16]. Two other studies found much higher rates of PTSD symptomatology among ambulance service workers at 21% and 22%, respectively [10,32]. The current study also found high rates of depression among paramedic trainees (28%). Depression was a significant predictor of PTSD and had a mediating effect between trauma exposure and PTSD status. of disaster workers 16% of workers developed depression seven months after work-related trauma exposure [11].

Differences in the rate of depression may, in part, be due to ascertainment differences or secondary to the high rates of exposure to trauma in South Africa. Rates of alcohol abuse were similarly high with 24% of paramedic trainees meeting criteria for abuse.

Twelve-month prevalence rates of alcohol abuse in the South African general population have been estimated at 4. 5% and 11. 1 for life-time prevalence in the age group 18–34 (based on a lay administered structured interview) [30].

A study conducted in the South African higher educa- tion sector found that 11% of students in the age group 15–49 consumed alcohol on a weekly or daily basis [33].Males had higher rates of alcohol abuse than females. These findings are in line with the South African Stress and Health study where substance use dis- orders were found to be significantly associated with male gender. In a Brazilian study it was found that ambulance workers with PTSD had significantly poorer physical and mental health than workers without PTSD [35]. This, too, was the case in the current study, with the PTSD group endorsing more physical health ailments than the non- PTSD group. Paramedic trainees with PTSD had a higher mean number of varied traumatic exposures, higher levels of depression and stress, poorer

physical health and lower levels of social support and resilience than those without PTSD. Previous studies have also shown that higher trauma exposure, stress and depression levels, low resilience and low social support are associated with PTSD [18,36,37]. Overall, resilience and social support were predictors of PTSD status. Social support is considered to im- prove coping, decrease stress levels and has a positive effect on health and well-being [38]. In a Dutch study, so- cial support in the workplace was found to positively pre- dict PTSD in emergency care personnel [16]. While studies have investigated PTSD among paramedic staff in South Africa, none, to our knowledge, have investigated predictors of PTSD among paramedic trainees. Trauma exposure is common among paramedic staff and trainees are particularly vulnerable to the adverse effects associated with trauma exposure, due to a lack of experience. The homogeneity of the sample is an added strength as there have been few studies on risk factors for PTSD that focus on specific trauma types and at-risk populations. Future studies could compare the effects of trauma frequency and repeated same-trauma exposures on mental and physical health outcomes in paramedic trainees and practicing, experienced paramedics, as well as include other occupation groups, such as police officers and fire fighters.

Table 2: Comparison of mental and physical health measures of participants based on PTSD status

	With PTSD			Without PTSD			U	df	p
	n	Mean rank	Sum of ranks	n	Mean rank	Sum of ranks			
Trauma exposure	21	83.79	58.16	103	58.16	5999.50	634.5	124	.003
Depression (CES-D)	21	103.05	2164	101	52.86	5339	188	122	.000
Perceived stress (PSS-10)	21	91.07	1912.5	101	55.35	5590.5	439	122	.000
Physical health symptoms (PHQ-15)	21	92.19	1936	102	55.78	5690	437	123	.000
Resilience (CDRISC)	20	43.33	866.50	102	65.06	6636.50	656.5	122	.012
Social support (MSPSS)	21	43.48	913	103	66.38	6837	682	124	.008
Alcohol abuse (AUDIT)	21	72.52	1523	103	60.46	6227	871	124	.154

Table 3: Parameters for the variables predicting PTSD status

Model		B	Std. error	Wald's χ^2	Sig.	Exp(B) odds ratio	95% confidence interval	
							Lower limit	Upper limit
1	Age	-.12	.09	1.88	.171	.89	.75	1.05
	Gender	-.20	.58	.12	.731	.82	.24	2.57
	Population group				.754			
	Trauma exposure (LEC)	.24	.08	8.90	.003*	1.27	1.09	1.49
2	Age	-.32	.18	3.41	.065	.72	.51	1.02
	Gender	.09	.87	.01	.919	1.09	.120	6.05
	Population group				.940			
	Trauma exposure (LEC)	.15	.11	1.77	.184	1.16	.93	1.43
	Perceived stress (PSS-10)	-.02	.09	.04	.834	.98	.83	1.16
	Alcohol abuse (AUDIT)	-.90	1.08	.70	.404	.41	.05	3.39
	Alcohol dependence (AUDIT)	.29	1.57	.04	.852	1.34	.06	28.84
	Depression (CESD)	.21	.07	8.75	.003*	1.23	1.07	1.42
3	Age	-.36	.19	3.66	.056	.70	.48	1.01
	Gender	.37	1.04	.13	.723	1.45	.19	11.15
	Population group			1.34	.855			
	Trauma exposure (LEC)	.14	.12	1.34	.248	1.15	.91	1.46
	Perceived stress (PSS-10)	.04	.10	.19	.667	1.05	.86	1.28
	Alcohol abuse (AUDIT)	-2.42	1.28	3.56	.059	.09	.01	1.1
	Alcohol dependence (AUDIT)	.76	1.75	.19	.666	2.13	.07	65.43
	Depression (CESD)	.34	.11	9.83	.002*	1.40	1.13	1.73
	Social support (MSPSS)	-.07	.03	5.43	.020*	.93	.87	.99
	Resilience (CDRISC)	.11	.05	5.41	.020*	1.12	1.02	1.24

*p < .05.

V.   CONCLUSION

In conclusion, there is a need to better understand risk and mitigating factors for PTSD in high-risk occupational groups. The results of this study indicate that paramedic trainees have high rates of PTSD and those who meet PTSD criteria have higher rates of perceived stress and de-pression, lower rates of social support and resilience, and poorer physical health, which can be detrimental to overall health. The study findings also suggest that depression is a mediating factor for PTSD and social support and resilience are significant predictors of PTSD.

The need for efficient screening of PTSD and depression symptomatology in trauma-exposed high risk groups needs to be emphasized so that targeted psychological and supportive interventions, initiated early and continued over time, can be offered. Paramedic trainees who have been exposed to multiple traumas and who have poor social support and resilience may be in need of preventative psychotherapeutic interventions in the workplace to offset the development of PTSD and other psychiatric sequelae. While paramedic trainees may need additional support, it should be noted that they were exposed to work-related traumatic events over a relatively short time period. With the passage of time and accumulation of experience, these trainees may show adequate psychological adjustment in this setting. These results are arguably generalizable to paramedic trainees beyond South Africa as these occupational groups bear many similarities with regards to work-related trauma, regardless of setting.

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