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**Work based risk factors and quality of life in health care workers providing maternal and newborn care during the Sierra Leone Ebola epidemic: findings using the WHOQOL BREF and HSE Management Standards Tool**

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## Abstract

### Introduction

Before the 2014 Ebola epidemic in Sierra Leone health care workers (HCWs) faced many challenges. Workload and personal risk of HCWs increased but their experiences of these has not been well explored. HCWs evaluation of their quality of life and risk factors for developing work-based stress is important in helping to develop a strong and committed workforce in a resilient health system.

### Methods

Cross sectional study using WHOQOLBREF and Health and Safety Executive (HSE) Standards Tools in 13 Emergency Obstetric Care facilities to; 1) understand the perceptions of HCWs regarding workplace risk factors for developing stress, 2) evaluate HCWs perceptions of quality of life (QoL) and links to risk factors for workplace stress, 3) assess changes in QoL and risk factors for stress after a stress management programme.

### Results

222 completed the survey at baseline and 156 at follow-up. At baseline HCWs QoL was below international standards in all domains. There was a significant decrease in score for physical health and psychological well-being (mean decrease (95% CI); 2.3 (0.5 – 4.1) and 2.3 (0.4 – 4.1)). Lower cadres had significant decreases in scores for physical health and social relationships (13.0 (3.6 - 22.4) and, 14.4 (2.6 - 26.2)). On HSE peer-support and role understanding scored highly (mean scores 4.0 and 3.7 on HSE), workplace demands were average or high-risk factors (mean score 3.0). There was a significant score reduction in the domains relationships and understanding of role (mean score reduction (95% CI) 0.16 (0.01 – 0.31) and; 0.11 (0.01 – 0.21)), particularly amongst lower cadres (0.83 (0.3 - 1.4).

### Conclusion

HCWs in low-resourced settings may have increased risk factors for developing workplace stress with low quality of life indicators, further exploration of this is needed to support staff and develop their contribution to the development of resilient health systems.

**Word Count**: 300

**Keywords:** healthcare systems, workplace stress, quality of life, Ebola Virus

**Article Summary**

*Strengths*

* The is the first study to explore the problem of work-based stress and quality of life among healthcare providers providing emergency obstetric care (EmOC) in Sierra Leone.
* Using both the HSE questionnaire and the WHOQOLBREF allowed assessment of workplace risk factors for stress on workers demonstrating high levels of stress amongst workers, limited support and overall low quality of life. Findings from the study were used by the Ministry of Health and Sanitation and included in an induction programme for health care workers on managing work based stress

*Limitations*

* The timing between baseline and follow-up was only eight weeks and it would have been useful to extend the study to assess effectiveness of the programme for at least six months.
* The study was completed during the Ebola epidemic which may have altered stress levels of health care workers compared with the period prior to the epidemic. No studies are available of the levels of stress amongst health care workers prior to the epidemic.
* We did not assess any changes within the working environment from baseline to follow up as the Ebola epidemic progressed, or take account of external factors, and this may have impacted on the final results. The authors acknowledge that when using multiple tests of statistical significance there is an increased risk of spurious statistically significant findings

**Introduction**

Prior to the EVD epidemic Sierra Leone already faced many challenges in providing health care due to a lack of resources and a shortage of qualified healthcare workers, with just 0.22 nurses/midwives and 1.66 medical doctors per 10,000 population compared to the WHO recommendation of 23 doctors and nurses/midwives per 10,000 population [1]. The lack of adequately trained professionals means that both nurses and doctors frequently find themselves working in isolation, with minimal peer support yet required to provide care to both chronically and acutely ill patients. In addition to the low numbers of nurses and doctors there is also a lack of senior staff with post basic, specialist training and experience, resulting in junior or inexperienced staff taking on additional clinical skills that they may not be trained for [2]. Working conditions for all cadres of staff in all grades of facilities, from primary to tertiary care, are poor, without a regular supply of electivity and/or running water, and a chronic shortage of medicines and clinical supplies. As a consequence of this staff are unable to provide the optimum, and sometimes even the most basic, level of patient care.

The scale of the 2014-2015 Ebola virus disease (EVD) epidemic across West Africa was unprecedented with a total of 27,049 cases and 11,149 deaths across the three countries worst affected (Sierra Leone, Guinea and Liberia) [3]. Sierra Leone reported 8704 confirmed cases and 3589 deaths. Healthcare workers in Sierra Leone were severely affected with a 74% case fatality rate amongst healthcare workers who contracted EVD (296 cases, 221 deaths) compared to an overall case fatality rate of 41% in the general population.

The continuing fragile state of the Sierra Leonean health system following the end of the civil war meant that the country was ill-prepared to manage such a large scale health emergency [4]. During the epidemic healthcare workers experienced several additional challenges to those faced in their normal working life. These included an increased risk to their own health, concerns for the safety of their families and community, loss of colleagues and a further increased workload [5]. All of these are likely to have contributed to increasing levels of workplace stress. When caring for highly infectious Ebola patients, there is evidence to show that staff are able to cope better if there are adequate resources and training. [6, 7]. However, in a low resourced setting adequate levels of training and resources may not be available.

Stress has been defined as a state in which individuals are unable to bridge the gap between what is expected and required of them and what they can achieve [8]. However, prolonged stress can lead to reduced effectiveness at work and even cause ill-health [8]. The Job-Demand Resources (JD-R) model describes work-related stress as being the result of the inability to meet demands placed on an individual within the context of their work role [9, 10]. Demands such as the overall workload and the time set for completing this combined with the degree of control over the working day are determinants of job-related anxiety, psychological strain, ill health and burnout [9, 10]. In the JD-R model, “demands” encompass all those physical and/or psychological aspects of the job which require effort on the part of the worker. Alternative theories of workplace stress consider the ‘’effort and reward imbalance’’ (ERI) rather than the demands and control [8]. The ERI model assumes that where there is an imbalance between effort (work demands and intrinsic motivation) and reward (salary, job security, career opportunities) then job strain will occur. This strain can then lead on to ill health and burnout [11].

Finding ways to help workers to better cope with stressful environments has led some researchers to look at the role of resilience within workplace. Resilience has been defined as ‘the ability to adapt to adversity’, [12] or the ‘ability to rebound or ‘bounce back’ from adversity’ [13]. Early work on work-based resilience focused on individual resilience (especially with regard to vulnerable children), community and family resilience. More recent research has considered how both employees and organisations themselves can impact on resilience. Resilience is seen as a positive organisational factor which can help individuals and organisations (especially healthcare organisations) reduce absenteeism, improve well-being of healthcare workers and patient care [14]. Predictors of resilience include adaptability, psychological attributes, finding meaning in adversity, having a positive identity, positive coping skills, social support and spiritual connection [15]. A lack of resilience in the workplace and increased work-based stress levels may also impact on overall quality of life negatively impacting not just on the individual but the wider family group and community [15].

The above concepts of work-related stress amongst healthcare workers are well-recognised phenomenon in high-income settings and it is known that midwives, nurses and doctors have specific operational pressures that are exacerbated by the dynamic working environment of healthcare provision [11]. Issues such as workload, job satisfaction and engagement with work have been shown to impact on nurse’s psychological health, demonstrating that both personal and workplace factors can influence stress levels [16].

Increased levels of stress can lead to poor performance at work and in health care this may affect patient outcomes [9, 15, 17]. However, there is little information available from low- and middle-income countries regarding the understanding, experiences, and, effect of stress on job satisfaction and the ability of healthcare workers to fulfil their roles, or not [18]. What evidence there is from low- and middle-income countries shows that, rather than concentrating on the numbers of available health care workers, there needs to be a focus on the work climate and job satisfaction to help develop productive workers and reduce risk factors for stress [19]. Providing interventions to limit workplace risk factors for stress may help to prevent burnout amongst workers, which can lead to emotional exhaustion, disconnect from the workplace, a lack of personal accomplishment and lead to poor patient care [20]

In the context of the EVD outbreak in Sierra Leone there were new and additional expectations placed on healthcare workers. Healthcare workers were expected to manage patients with a disease that was previously unknown within the country while continuing work in an environment with inadequate resources to do this safely [21]. The risk of infection for healthcare workers in maternity care areas was further exacerbated because of the frequent risk of contact with bodily fluids when caring for women during the various stages of pregnancy, and particularly during birth [18]. In addition, it is known that the signs and symptoms of obstetric emergencies such as haemorrhage or sepsis mirror those of EVD and this can make it difficult to differentiate between women who require emergency obstetric care in a standard maternity care setting, and, women who have signs and symptoms of EVD and require management in separate specialised areas [18].

This study aimed to; 1) understand the perceptions of healthcare providers regarding workplace risk factors for developing stress, 2) evaluate healthcare worker’s perceptions of quality of life and its links to risk factors for developing workplace stress, and, 3) assess changes in QoL and risk factors for stress after a stress management programme.

## Methods

Given the country specific context at the time of the study (the ongoing Ebola epidemic) and the continued low resourced and fragile state of the healthcare system in Sierra Leone, we used the Job -Demand Resources model as the conceptual framework for this study. The study took place from January to September 2015 with data collection and the stress management programme occurring between the months of July and August 2015 when the number of Ebola cases was reducing rapidly; Sierra Leone was declared free of Ebola in November 2015 [18].

### Participants

A purposive sample of three (Freetown Rural, Freetown Urban and Bo) out of a total of 14 districts in Sierra Leone were chosen at the request of the Ministry of Health and Sanitation. All 13 healthcare facilities designated as providing either Basic Emergency Obstetric Care (BEmOC) or Comprehensive Emergency Obstetric Care (CEmOC) [18] within the selected districts were included. All staff in each health facility (n=222) were invited to participate in the study. Given the time scale of the study it was not possible to conduct a pilot study.

**Patient and public involvement**

No patients or members of the public were included in the study.

### Ethical considerations and consent to participate

Ethical approval was obtained from the Sierra Leone Ethics and Scientific Review Committee and the Liverpool School of Tropical Medicine Ethics Committee (15.012). Participants were provided with both verbal and written explanations of the study and asked to sign an informed consent if they wished to take part. Participation in completing the questionnaire was voluntary and participants could opt out at any stage.

### Data collection and tools

Two self-administered questionnaires (HSE Standards tool and WHOQOLBREF) were completed by participants at baseline and again eight weeks after a training workshop in stress management. The questionnaires were in English which is widely spoken in Sierra Leone and the de facto official language. All primary, secondary and tertiary education and healthcare worker training is conducted in English. No validated tools were available which had been used to look at work related stress within Sierra Leone, which reflects the lack of research in this area.

The UK Health and Safety Executive (HSE) Management Standards Tool for work-related stress was used to measure healthcare worker’s perceptions of workplace risk factors that may increase workers’ stress as it has been used across a number of countries and for a wide variety of workers [22]. The questionnaire includes 6 main areas which can potentially influence a healthcare workers’ environment: 1) the workload demands on workers; 2) the control workers feel they have in organising and managing their workload, 3) the support through encouragement, sponsorship and resources that workers feel that they receive from their managers and peers; 4) the presence of healthy workplace relationships to promote positive working and prevent conflict, 5) whether people understand their role in the organisation and 6) how organisational change is managed and communicated in the organisation [20]. For purposes of analysis and to provide more detail domain 3 (peer and manager support) is separated giving a total of seven domains. Scoring is via a Likert scale from 1 to 5. A score of 3 is average. A score of 1-2 is indicative of extreme stress. A score of 4-5 is indicative of low stress levels. The HSE provide a data analysis tool and recommendations on the smallest sample size to be included from the workplace. Where there are fewer than 500 workers it is recommended that all workers are given the opportunity to participate.

Stress in the workplace may also have an impact on home and social life. Therefore, healthcare workers’ assessment of their quality of life were measured using the WHO Quality of Life BREF [23] questionnaire, which is based on the WHOQOL-100 and was developed to provide a shorter form for quality of life assessment (QOL). The WHOQOL BREF includes 26 of the 100 questions in the WHOQOL–100 and includes the same 4 domains contributing to quality of life, 1) physical health (seven questions, e.g. activities of living, energy, fatigue), 2) psychological health (six questions, e.g. body image, negative feelings, self-esteem), 3) social relationships (three questions, e.g. personal relationships, social support) and 4) the environment (eight questions, e.g. finance, home environment, freedom, transport) [23]. Scoring for each question is on a Likert scale from 1 to 5. For each domain raw scores were averaged and converted to percentage scores as per WHO syntax for the WHOQOL-BREF, with higher scores reflecting higher quality of life. The validated questionnaire has been used widely across a variety of populations and in high, low- and middle-income countries.

### Programme for recognition and management of workplace-related stress

A total of 52, facility based, lead health care workers (a subset of the 222 participants) (four from each of the 13 healthcare facilities) participated in a one-day stress management programme and in the completion of the questionnaires with the remaining facility staff (total 222). The programme aimed to; 1) provide basic training for key health care workers in stress management who could then go on to provide support in stress management to staff in their workplace; 2) provide participants with the basic skills to recognise risk factors for workers developing stress in their workplace. Participants for the programme were selected in cooperation with the facility teams and the District Health Management teams based on their role in the facility and the level of managerial support they were expected to give. Health facility managers were included in the training as they are often part of the support network for staff in Sierra Leone. The programme helped healthcare workers to recognise and manage stress and develop resilience in the workplace. Participatory, student focused teaching techniques (for example group work, role play, individual work) were used to encourage participant interaction and engagement, help to develop problem solving skills and facilitate learning [24]. Short lectures and question and answer sessions were also used to deliver some theoretical aspects of the course. The sessions included learning on: 1) the physical, emotional, behavioural and psychological manifestations of stress in a healthcare worker; 2) the concept of resilience and recognising this as a mixture of personal characteristics and skills which can be developed through training; 3) recognising signature strengths, coping with challenging thoughts and using ‘tough’ experiences; 4) recognising what makes one feel good including physical, spiritual and social support factors and managing stress through relaxation, coping mechanisms and mindfulness. On return to their work place participants were expected to be better able to recognise risk factors for workplace stress in their areas, provide colleagues with training in the recognition and management of workplace stress and develop strategies to manage risk factors in their work area. Between baseline and follow up researchers from the Liverpool School of Tropical Medicine (LSTM) continued to liaise with the relevant health care facilities to offer support and monitor use of the workshop. LSTM researchers were also asked by the Ministry of Health and Sanitation (MoHS) to provide similar but shorter training sessions for newly appointed health care workers in the year following the initial workshop.

Before implementation, the content of the programme was reviewed in consultation with local health care providers to ensure all aspects were locally relevant. All training was facilitated in-country jointly by national and international facilitators using a participatory adult learning approach which included group work, discussion and self-led participant exercises.

### Data analysis

For the HSE questionnaire, descriptive analysis was used to provide information on each of the seven competency areas; demands, control, support (managers and peer), relationships, role and organisational change. Scores for each area and overall were calculated both for baseline (before the training programme) and for follow up. Baseline scores for each area and overall were analysed using three-way analysis of variance with factors for district, cadre (5 categories excluding 1 doctor and 4 managers) and facility type to identify any pre-existing statistically significant differences between categories for these factors. Follow up scores were compared with baseline scores for each area and overall were compared using paired t-tests. To examine whether cadre, district or facility type influenced any change in scores analysis of covariance (ANCOVA) was used, with the scores after training as the response, scores at baseline as covariates (to estimate the contribution of the baseline score to the follow up score) and factors for each of cadre, district and facility type (to estimate any differences after accounting for baseline differences). Estimated differences are reported with 95% confidence intervals.

Scores for each domain of the WHOQOL-BREF and overall were derived following the syntax provided by WHO (<http://www.who.int/mental_health/media/en/76.pdf>) The mean score for each question within each domain was used to calculate the overall domain score. Mean scores were multiplied by 4 to make them comparable with the scores used in the WHOQOL-100. Where 20% of data was missing from the WHOQOL-BREF questions the data for that domain for the respondent was discarded. Otherwise, where an item was missing the mean of the other items was substituted. Population norms for the four domains were calculated in a study by Hawthorne et al (2005) using randomly sampled communities from Victoria, Australia in two studies [25]. These were used as the international standard for comparison in this study. The values are provided by domain: Physical health 73.5 (SD = 18.1); Psychological wellbeing 70.6 (14.0); Social relationships 71.5 (SD 18.2) and Environment 75.1 (SD 13.0).

## Results

All 222 workers in the facilities agreed to participate in the study. Of the 222 workers assessed at baseline 156 were re-assessed. At baseline, 222 participants completed the HSE questionnaire and the WHOQOL-BREF. Of these 156 completed at least one of the questionnaires at follow-up (two participants only completed one but not the other of the two questionnaires). The majority of respondents were female (199/222, 89.6%) and aged between 25-45 years (163/222, 73.4%) (table 1)

At baseline mean scores from the HSE questionnaire indicated an average risk of developing stress (a score of 3) in four of the seven domains (control over work, relationships, managers support and response to workplace change). Scores for two of the domains (peer support and understanding of role) were indicated as low risk factors for developing stress (between 1 and 2). The highest risk factor for developing workplace stress at baseline was in the domain of workplace demands. When all domains were combined there was an average risk for developing workplace stress.

WHOQOL BREF results at baseline demonstrated a self-reported, low quality of life across all domains (physical health, psychological well-being, social relationships and environment) compared to population norms. When combined with results of the HSE questionnaire this raises concerns about the ability of health care workers to cope in their workplace, particularly given the high workplace demands that they face. Detailed results of the HSE and WHOQOL BREF are given below.

Participants were inclusive of all maternity staff cadres; 62.2% (138/222) of respondents were Maternal and Child Health Aides (MCHA) and State Enrolled Community Health Nurses (SECHN) who together make up the majority of healthcare workers in Sierra Leone. Other cadres included Registered Nurse-Midwives (21/222; 9.5%) and Middle Grade staff (19/222; 8.6%). In addition, care assistants (31/222; 14.0%) and support staff (7/222; 3.2%) were included in the assessment. For the purposes of further assessment – nurse midwives, MCHA, SECHN and middle grade staff or doctors were considered to have a ‘higher level’ of training and care assistants and support staff were considered to have a ‘lower level’ of training

### Workplace risk factors (HSE questionnaire)

The lowest scores (highest risk) both at baseline and at follow up were obtained for the domain workplace demands. At baseline, this had a mean (sd) value of 2.98 (0.56) (**Table 2**) which did not vary significantly between districts, cadres or facility type. At follow-up the mean (95%CI) change from baseline was (0.02)-0,09,0.13). (**Table 2**).

When baseline scores for all domains were combined for all participants, the mean score across all HSE domains combined (3.74) is indicative of an average risk for healthcare workers developing stress.

For each domain Cronbach’s α at baseline was between 0.51 and 0.65 which is too low to indicate satisfactory consistency (Table 1). For those assessed at follow up Cronbach’s α for the overall score was 0.75 which indicates satisfactory consistency whereas for each domain the values were between 0.46 and 0.69 which do not indicate satisfactory consistency (**Table 2).**

The mean (95% CI) reductions in score were 0.21 (0.14 - 0.28) for the overall score. 0.16 (0.01 – 0.31) for relationships and 0.11 (0.01 – 0.21) for understanding of role (**Table 2)** indicating that the risk in these areas increased during the pandemic. Analysis of covariance (ANCOVA) (the coefficient derived in the ANCOVA for the contribution of the baseline stress score for the domain under analysis) estimated the coefficient for the contribution of the baseline stress score to the follow-up score to vary between 0.16 (response to workplace change) and 0.46 (for control over work environment) and 0.48 (for HSE domains combined). ANCOVA found evidence of a difference between cadres in follow-up scores, after accounting for baseline scores, for relationships (lower qualified staff were estimated to score 0.83 lower than higher qualified staff) and understanding of role (lower qualified were estimated to score 0.36 lower than higher qualified staff). For understanding of role there was also evidence of a difference between districts (those in Bo were estimated to score 0.26 lower than those in Urban Freetown; **Table 3**).

### WHOQOL BREF questionnaire

For the WHOQOLBREF scores Cronbach's α at baseline was 0.83 which indicates very satisfactory consistency for the overall score. For the environment domain it was also satisfactory, with a value of 0.71. However, for the other three domains Cronbach’s α at baseline was between 0.57 and 0.65 which is too low to indicate satisfactory consistency (**Table 4**). For those assessed at follow up consistency was similarly very satisfactory for WHOQOLBREF (Cronbach’s α: 0.84), satisfactory for environment (0.76) and not satisfactory for the other domains (Cronbach’s α between 0.64 and 0.67; **Table 4**).

The mean scores for each of the domains for all participants combined, were below the international average for each of the domains of the WHOQOLBREF questionnaire at both baseline and follow-up (**Table 4**). At baseline, the mean (95% CI) score for Bo was 4.6% (1.7%, 7.5%) (lower than for Freetown Urban) and differed between facility type indicating a lower quality of life for those workingoutside of the capital (Freetown). The mean scores for healthcare facilities designated to provide Comprehensive EmOC were lower (that is HCWs reported a lower quality of life in these domains) than in Basic EmOC health care facilities for physical health (6.4% (3.4%, 9.5%)), environment (6.9% (3.5%, 10.4%)) and the overall combined score (4.7% (2.1%, 7.2%)).

Between baseline and follow-up there was a reduction in WHOQOL-BREF score for physical health (95% CI) reduction: 2.3 (0.5 - 4.1), for psychological well-being (mean (95% CI) reduction: 2.3 (0.4 – 4.1) and for the overall combined score (mean (95% CI) reduction: 1.6 (0.2, 3.0)), indicating a deterioration in quality of life related to these domains. Analysis of covariance (ANCOVA) (the coefficient derived in the ANCOVA for the contribution of the baseline WHOQOL BREF score for the domain under analysis) estimated the coefficient for the contribution of the baseline WHOQOL BREF score to the follow-up score to vary between 0.29 for psychological well-being and 0.64 for environment. ANCOVA found no statistically significant evidence of differences between districts or facility type in the WHOQOL-BREF scores at follow-up. For cadre, the only differences found were for support staff for whom there was a lower mean (95% CI) score than for registered nurse/midwives in physical health (13.0 (3.6,22.4)), social relationships (14.4 (2.6,26.2) and the overall WHOQOL-BREF score (9.92 (1.9,17.9)) **(Table 5).**

## Discussion

This study found that whereas the overall risk of stress was noted to be ‘average’, level of risk for the development of stress was particularly related to the workplace demands placed on healthcare providers. This finding resonates with the JD-R model which sees the development of stress as an imbalance between the demands placed on workers and their ability to meet them Control over working environment is also a key component of the JD-R model, and though workers reported an average score for the risk factor related to control of their working environment, high job demands may increase this risk factor over time.

Health care workers reported a good level of peer support is in place with respondents having a good understanding of their roles. Both peer support and understanding of role can help to mitigate against developing workplace stress. Health care providers with a lower level of training and /or working in a health care facility designated to provide Comprehensive EmOC had more identified work-related stress risk factors than those who were more senior and/or working at a healthcare facility providing Basic EmOC. This has implications for the support and training these workers may need to cope with the demands of their job within this setting. With the correct training, equipment and support HCW from any cadre and in any setting should be able to cope with the demands placed on them, even during a crisis such as the Ebola epidemic.

The overall aim of the study was to help staff understand and recognise the risk factors for workplace stress and to begin to develop skills to better manage these risks. In the short term, the scores for workplace stress decreased further suggesting that healthcare workers might have used a better knowledge and understanding of stress and workplace stress to re-assess their working environment in more detail. To build resilience and to improve the workplace environment more support is needed.

Interpretation and implications for practice

Below average scores in the WHOQOL-BREF questionnaire domains of physical and psychological health may be indicative of the negative effect workplace demands have on the physical and psychological wellbeing of healthcare providers [26]. However, they may also be influenced by factors external to the work environment for workers living in a low-income country such as Sierra Leone. Previous studies have shown that workers who have high demands placed upon them can show unsafe practices which should be of particular concern in health care [27]. In addition to work place demands previous studies have suggested work based and social support are also positively associated with wellbeing, lower levels of depression, burnout and psychological distress and greater life satisfaction [28, 29]. Health service manages therefore need to understand the impact of increased work load and support not just on the individual but also on quality of care and implement measures which support health care workers to maintain standards of care. These measures should include addressing the quality of pre and in-service training, peer and managerial support and providing an enabling working environment.

Having an enabling environment (including adequate resources to work with) has also been shown to be an important factor in managing workplace demands in health care [30, 31]. Prior to the EVD epidemic, healthcare workers in Sierra Leone were already working with too few resources within a weak health system [32]. The need for additional equipment to safely manage patients with EVD exacerbated this lack of resources. Scores obtained in this study for environmental demand suggest this might be the case, and, these did not change in the short time, despite the influx of resources and money into Sierra Leone as part of the Ebola response effort. Healthcare providers in Sierra Leone face daily, long term challenges both at home and in work with limited electricity and clean water supply, poor transport infrastructure and low standards of health care, which may all make managing workplace demands more challenging. Workers in the second city of the country, Bo, reported worse quality of life than their peers in the capital Freetown. This may be due to the extra resources and facilities that are available within the capital city compared to Bo. In contrast workers in Bo scored higher regarding workplace risk factors (that is there was less risk) compared to their peers in Freetown. The reasons for this are unclear and may relate to the types and number of patients seen in facilities, proximity or not to the MoHS, staffing levels and mix of cadres or other characteristics of the workplace.

Though designed for use in the UK the HSE Management Standards Tool has also been used in a number of countries including Italy, the Philippines and Australia [33,34,35]. An important element of this study was the development and use of culturally appropriate tools to measure and support work stressors and quality of life but also to inform and allay fears within a culture where fear and stigma of psychological ill-health is apparent. Finding an appropriate tool to measure resilience was difficult primarily due the fact that many of the available measures may not be culturally sensitive and appropriate to the clinical setting and healthcare professionals [36]. Since the HSE and WHOQOL-BREF had been used extensively in several other countries, and, following negotiations with colleagues in Sierra Leone, it was considered appropriate to use these.

Within the context of this EVD epidemic there may have been a need for additional support for healthcare workers to cope with the humanitarian situation. Previous studies suggest that the majority of healthcare workers exposed to traumatic or challenging events do not suffer from any long term negative psychological effects and do display resilience, but the minority who do experience distress need to be supported [37]. The EVD epidemic was associated with increased risk for healthcare providers who, however, largely remained in post to provide maternity care. Health managers need to better understand why it is that health care workers continued to provide care, despite the negative impact on themselves and what the implications of this are for developing a resilient work force. Authors such as Kruk et al [38] see a strong and committed work forces as a key element of a resilient health system, yet there is little description of what this means for health care workers in low resourced settings. Within such settings where health care workers are reporting a low quality of life and high risk factors for developing work based stress questions need to be asked if they should also shoulder the additional burden of responsibility that a resilient health system will require. If this burden is to be placed on health care workers then further support will be needed to help them manage this.

The training programme devised for the study was well received by both the participants and MoHS. There had been no similar training for health care workers in the country and as a consequence of using the programme in this study further training programmes were instigated by the MoHS. The programme was incorporated into training days for health care workers newly recruited to the MoHS in recognition of the need for more support for health care workers. However, the dynamic situation during the Ebola epidemic will have impacted on the impact of the training programme and the ability of health care workers to provide increased peer support during the epidemic.

## Conclusion

A 5-year plan for Sierra Leone to build a more resilient health system which provides routine care as well as being able to withstand any future epidemics is being implemented. Frameworks of resilience cite a committed and strong work force as being important for developing resilience and health system strengthening but this may be undermined if workers face high levels of stress at work. For the individual high levels of workplace stress may impact on personal health and quality of life, affecting work performance and personal relationships. It is important therefore that further research is conducted on the best way to support workers in low income countries and low resourced working environments to reduce workplace risk factors for stress.

## Declarations

### Data sharing

Data are available upon reasonable request

### Competing interests

The authors have no competing interests to declare.

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### Contributions to authorship

SJ and JO conceptualised the study; SJ, JO, BS, FB, SBP conducted the primary research; SJ, SG, SW NVD analysed the data; SJ, NVD, SW, BS, FB, SBP, SG wrote the paper

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**Table 1: Characteristics of respondents assessed at baseline and at follow up**

|  |  |  |
| --- | --- | --- |
| **Category** | **Number assessed at baseline**  **(n=222)** | **Number assessed**  **at follow up (n=156)** |
| **District** | | |
| **Urban Freetown** | 85 (38.3%) | 51 (32.7%) |
| **Rural Freetown** | 49 (22.1%) | 35 (22.4%) |
| **Bo** | 83 (37.4%) | 66 (42.3%) |
| **Cadre** | | |
| **Doctor** | 1 (0.4%) | 1 (0.6%) |
| **Registered nurse-midwife** | 21 (9.5%) | 17 (10.9%) |
| **Middle grade staff** | 19 (8.6%) | 14 (9.0%) |
| **Maternal and Child Health Aide or State Enrolled Community Health Nurse** | 138 (62.2%) | 94 (60.3%) |
| **Care-assistant** | 31 (14.0%) | 23 (14.7%) |
| **Support staff** | 7 (3.2%) | 6 (3.9%) |
| **Manager** | 4 (1.8%) | 1 (0.6%) |
| **Facility type** | | |
| **Comprehensive EmOC\*** | 76 (34.2%) | 46 (29.5%) |
| **Basic EmOC\*** | 146 (65.8%) | 110 (70.5%) |
| **Gender** | | |
| **Male** | 20 (9.0%) | 16 (10.3%) |
| **Female** | 199 (89.6%) | 137 (87.8%) |

\*EmOC = Emergency Obstetric Care

**Table 2: Comparisons of scores at baseline and follow-up for workplace risk factors by domain (HSE questionnaire)\***

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Domain** | **Baseline** | | | **Follow up** | | | **Change from baseline to follow-up** |
| **n a** | **Cronbach’s α** | **Mean (sd)** | **nb** | **Cronbach’s α** | **Mean (sd)** | Mean  (95% CI) |
|
| **Workplace demands** | 213/ 220 | 0.55 | 2.98  (0.56) | 139 | 0.64 | 2.98  (0.59) | 0.02  (-0.09,0.13) |
| **Control over work environment** | 213/ 220 | 0.64 | 3.22  (0.70) | 145 | 0.69 | 3.19  (0.71) | -0.08  (-0.19,0.04) |
| **Managers' support** | 213/ 220 | 0.56 | 3.80  (0.66) | 150 | 0.50 | 3.77  (0.59) | -0.08  (-0.20,0.04) |
| **Peer support** | 213/ 220 | 0.51 | 4.08  (0.56) | 150 | 0.58 | 4.05  (0.58) | -0.09  (-0.19,0.00) |
| **Relationships** | 213/ 220 | 0.54 | 3.67  (0.74) | 147 | 0.69 | 3.55  (0.85) | **-0.16**  **(-0.31,-0.01)** |
| **Understanding of Role** | 212/ 219 | 0.65 | 4.51  (0.59) | 146 | 0.58 | 4.45  (0.54) | **-0.11**  **(-0.21,-0.01)** |
| **Response to workplace Change** | 216/ 217 | 0.60 | 3.54  (0.85) | 144 | 0.46 | 3.50  (0.77) | -0.05  (-0.22,0.12) |
| **HSE domains combined** | 209/ 216 | 0.70 | 3.74  (0.36) | 106 | 0.75 | 3.58  (0.35) | **-0.21**  **(-0.28,-0.14)** |

\*A score of 3 is indicative of average levels of risk for stress, 4-5 indicates low levels and 1-2 high levels of risk for stress.

a Numbers given are those with data for domain and the three factors/number with data for domain

b Numbers with data at baseline and follow-up for the domain

**Table 3: Estimates Derived in Analysis of covariance of follow-up scores for workplace risk factors (HSE questionnaire)\***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Domain** | **Statistic** | **Baseline score as a covariate** | **District (vs Urban Freetown)** | | **Cadre (vs Registered Nurse/midwives)** | | | | **CEmOC vs BEmOC** |
| **Rural Freetown** | **Bo** | **Middle grade staff** | **MCHA / ECHN** | **Untrained staff** | **Support staff** |
| **Workplace demands (n=136)** | Coefficient\*\* (95% CI) | **0.29**  **(0.1,0.5)** | 0.03  (-0.3,0.3) | 0.06  (-0.2,0.3) | -0.06  (-0.5,0.4) | 0.08  (-0.2,0.4) | -0.08  (-0.5,0.3) | 0.50  (-0.1,1.0) | 0.19  (-0.0,0.4) |
| **Control over work environment (n=141)** | Coefficient (95% CI) | **0.46**  **(0.3,0.6)** | 0.09  (-0.2,0.4) | 0.15  (-0.1,0.4) | -0.11  (-0.6,0.4) | -0.10  (-0.4,0.3) | 0.02  (-0.4,0.5) | 0.02  (-0.7,0.7) | -0.14  (-0.4,0.1) |
| **Managers' support (n=146)** | Coefficient (95% CI) | **0.27**  **(0.1,0.4)** | -0.16  (-0.4,0.1) | 0.04  (-0.2,0.3) | 0.007  (-0.4,0.4) | 0.08  (-0.2,0.4) | 0.18  (-0.2,0.5) | 0.15  (-0.4,0.7) | 0.11  (-0.1,0.3) |
| **Peer support (n=146)** | Coefficient (95% CI) | **0.44**  **(0.3,0.6)** | -0.01  (-0.3,0.2) | 0.01  (-0.2,0.2) | -0.10  (-0.5,0.3) | -0.09  (-0.4,0.2) | -0.26  (-0.6,0.1) | -0.50  (-1.0,0.0) | -0.01  (-0.2,0.2) |
| **Relationships (n=143)** | Coefficient (95% CI) | **0.33**  **(0.2,0.5)** | -0.02  (-0.4,0.4) | -0.04  (-0.4,0.3) | -0.29  (-0.9,0.3) | -0.44  (-0.9,0.0) | **-0.83**  **(-1.4,-0.3)** | -0.29  (-1.1,0.5) | 0.22  (-0.1,0.5) |
| **Understanding of Role (n=142)** | Coefficient (95% CI) | **0.30**  **(0.1,0.5)** | -0.05  (-0.3,0.2) | **-0.26**  **(-0.5,-0.1)** | -0.23  (-0.6,0.1) | **-0.30**  **(-0.6,-0.0)** | **-0.36**  **(-0.7,-0.0)** | -0.70  (-1.2,-0.2) | 0.05  (-0.1,0.3) |
| **Response to workplace Change (n=140)** | Coefficient (95% CI) | **0.16**  **(0.0,0.3)** | 0.07  (-0.3,0.4) | 0.06  (-0.3,0.4) | 0.13  (-0.5,0.7) | -0.06  (-0.5,0.4) | -0.10  (-0.6,0.4) | -0.07  (-0.8,0.7) | -0.08  (-0.4,0.2) |
| **HSE domains combined (n=103)** | Coefficient (95% CI) | **0.48**  **(0.3,0.7)** | -0.05  (-0.2,0.2) | -0.001  (-0.2,0.2) | -0.22  (-0.5,0.1) | -0.12  (-0.3,0.1) | -0.19  (-0.4,0.1) | -0.25  (-0.6,0.1) | 0.04  (-0.1,0.2) |

\*\* For baseline the coefficient estimates the magnitude of influence of the score at baseline on the follow-up score; for district, cadre and facility type the coefficient estimates the difference specified. MCHA = Maternal and Child Health Aide; SECHN = State Enrolled Community Health Nurses; CEmOC = facility providing comprehensive emergency obstetric care; BEmOC = facility providing basic emergency obstetric care

**Table 4: Comparison of scores at baseline and follow-up for workplace risk factors by domain (WHOQOL BREF questionnaire)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Domain** | **Inter-national Standard (SD)** | **Baseline** | | | **Follow up** | | |
| **Change from baseline to follow-up** |
| **n a** | **Cronbach’s α** | **Mean (sd)** | **n** | **Cronbach’s α** | **Mean**  **(sd)** | **Mean**  **(95% CI)** |
|
| **Physical health** | 73.5 (18.1) | 208/ 217 | 0.57 | 52.3  (10.6) | 150 | 0.64 | 50.0  (10.9) | **-2.3**  **(-4.1,-0.5)** |
| **Psychological well-being** | 70.6 (14.0) | 212/ 221 | 0.65 | 54.3  (9.4) | 152 | 0.67 | 52.2  (10.2) | **-2.3**  **(-4.1,-0.4)** |
| **Social relationships** | 71.5 (18.2) | 213/ 222 | 0.64 | 56.3  (14.2) | 154 | 0.67 | 57.4  (12.8) | 0.7  (-1.9,3.2) |
| **Environment** | 75.1 (13.0) | 213/ 222 | 0.71 | 42.4  (11.3) | 153 | 0.76 | 41.8  (11.5) | -0.7  (-2.2,0.9) |
| **WHOQOL-BREF** |  | 207/ 216 | 0.83 | 50.1  (8.4) | 148 | 0.87 | 48.6  (9.2) | **-1.6**  **(-3.0,-0.2)** |

a Numbers given are those with data for domain and the three factors/number with data for domain

:Population norms: Physical health 73.5 (SD = 18.1); Psychological wellbeing 70.6 (14.0); Social relationships 71.5 (SD 18.2) and Environment 75.1 (SD 13.0).

**Table 5: Analysis of covariance of follow-up WHOQOL-BREF mean scores**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Domain** | **Statistic** | **WHOQOL BREF score**  **at baseline** | **District (vs Urban Freetown)** | | **Cadre (vs Registered Nurse/midwives)** | | | | **CEmOC vs BEmOC** |
| **Rural Freetown** | **Bo** | **Middle grade staff** | **MCHA / ECHN** | **Untrained staff** | **Support staff** |
| **Physical health (n=145)** | Coefficient (95% CI) | **0.52**  **(0.4,0.7)** | -3.79  (-8.5,0.9) | 0.88  (-2.8,4.6) | 0.82  (-6.3,7.9) | -0.27  (--5.5,5.0) | -2.8  (-9.0,3.5) | **-13.0**  **(-22.4,-3.6)** | -0.66  (-4.6,3.2) |
| **Psychological well-being (n=152)** | Coefficient (95% CI) | **0.29**  **(0.1,0.5)** | -1.19  (-5.8,3.5) | 1.06  (-2.8,4.9) | 0.26  (-7.0,7.6) | 1.44  (-3.9,6.7) | -4.17  (-10.5,2.1) | -4.4  (-14.6,5.8) | -1.04  (-4.8,2.8) |
| **Social relationships (n=147)** | Coefficient (95% CI) | **0.28**  **(0.1,0.4)** | -4.52  (-10.3,1.2) | -0.52  (-5.2,4.2) | -0.64  (-9.7,8.4) | -2.30  (-8.8,4.2) | -5.2  (-13.0,2.6) | **-14.4**  **(-26.2,-2.6)** | 0.57  (-4.1,5.3) |
| **Environment (n=148)** | Coefficient (95% CI) | **0.64**  **(0.5,0.8)** | -1.47  (-5.7,2.8) | -0.15  (-3.6,3.3) | -0.10  (-6.8,6.6) | 0.14  (-4.7,5.0) | -0.85  (-6.6,4.9) | -6.31  (-15.0,2.4) | 2.05  (-1.5,5.6) |
| **WHOQOL-BREF (n=149)** | Coefficient (95% CI) | **0.59**  **(0.4,0.7)** | -3.22  (-6.9,0.5) | 0.50  (-2.5,3.5) | 0.07  (-5.6,5.8) | -0.43  (-4.6,3.7) | -3.1  (-8.1,1.8) | **-9.92**  **(-17.9,-1.9)** | 0.18  (-2.9,3.3) |

MCHA = Maternal and Child Health Aide; SECHN = State Enrolled Community Health Nurses; CEmOC = facility providing comprehensive emergency obstetric care; BEmOC = facility providing basic emergency obstetric care