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Effect of Organizational and Environmental Stressors on Surgical Team Performance and Patient Safety in a Northwest Nigerian Tertiary Hospital: A Cross-sectional Study

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ABSTRACT

Background: Organizational and environmental stress has a significant impact on the job performance and patient's safety in a high-demand healthcare setting like operating theatre. This study aimed to assess effect of organizational and environmental stressors on surgical team member's performance and patient safety in a Northwest Nigerian tertiary hospital. Methods: A secondary analysis of a cross-sectional study was conducted among 177 surgical healthcare professionals. Data were collected using the National Institute for Occupational Safety and Health (NIOSH) Generic Job Stress adopted questionnaire and the Perceived Stress Scale. Both descriptive (mean and standard deviation) and inferential (chi-square tests, t-test and regression) statistical analyses were performed with statistical significance set at $p< 0.05$.

Results: The majority of the surgical team members reported experiencing moderate stress (65.0%) while 20.3% reported severe stress levels. Organizational stressors was ranked highest with overall mean score of 4.038, this was followed by environmental (3.981) and interpersonal (3.945) related. Common stress-related outcomes reported are musculoskeletal pains and fatigue (4.09 ± 0.79), poor job satisfaction (4.02 ± 0.78) and low motivation (4.01 ± 0.79). No statistically significant associated were found between stress levels and the years of experience ($\beta = -0.100$, $p = 0.254$) and weekly call hours ($\beta = 0.067$, $p = 0.385$).

Conclusion: The findings indicate that organizational and environmental factors have a greater impact on team stress compared to demographic variables. Implementing targeted interventions to improve workplace policies, environmental conditions, and support systems is critical for reducing stress, enhancing team performance, and maintaining patient safety.

Keywords: Stress, Surgical team, Patient safety, Organizational stressors, Nigeria, Job Demand-Control model.

BACKGROUND

Work-related stress is a significant occupational hazard in healthcare settings, particularly within operating theatres (OTs), where high-pressure settings can affect both surgical team members' performance and patient safety[1]. Surgical teams are prone to many stressors that negatively impact their ability to function optimally, which could be caused by fatigue, time demands, interpersonal conflicts, and the complexity of surgical procedures [2]. These stressors, if left unaddressed, can impair surgical outcomes, hinder learning opportunities for trainees, and pose a serious risk to patient safety [3]. For instance, research has shown that high stress levels among healthcare workers are associated with increased medical errors, longer hospital stays, and higher readmission rates [4].

The operating theatre setting works as a multidimensional contributing factor to stress, surrounding ergonomic design, technological demands, and interpersonal dynamics. Environmental stressors such as excessive noise from power equipment, poor lighting, cramped space and equipment malfunctions have been shown to increase cognitive workload and impair situational awareness among surgical teams [5-7]. These factors could be further compounded by hierarchical pressures and communication failure can also increase the psychological stress and fatigue among the surgical teams [8]. Moderate to severe stress levels have impacted the performance, impaired decision-making, and increased risk of adverse events in the theatre [9].

According to Sonoda and others [10], revealed that the impact of stress among the surgical team members varies across their professional roles and responsibilities. The study also showed that scrub nurses are frequently experiencing stress related to the technical aspects of surgery, while circulating nurses face higher stress due to collaboration and coordination demands, while surgeons and anaesthesiologists, on the other hand, are often stressed by time pressure and the complexity of surgical cases.

This study is guided by the Job Demand-Control (JDC) Model, proposed by Karasek [11], which posits that work stress arises from the interaction between job demands (workload, time pressure) and job control (decision-making autonomy and task management). According to this model, when job demands exceed an individual's capacity to control the work environment, stress levels increase, potentially leading to burnout, decreased performance, and compromised patient safety. In the surgical setting, was both cognitive and physical demands are exceptionally high, maintaining a balance between job demands and job control is crucial to enhancing team performance and patient outcomes.

Despite the recognition of stress as a critical issue in healthcare, there is limited empirical evidence on how stress affects surgical team performance and patient safety in tertiary hospitals in Nigeria. While studies from high-income countries have extensively documented the negative impact of stress on healthcare workers, few have explored how organizational, interpersonal, and environmental stressors uniquely influence Nigerian surgical teams. This gap in knowledge hinders the development of context-specific interventions aimed at mitigating stress and enhancing team performance.

Workplace stress among surgical teams affects not only their well-being but also significantly impacts patient safety and the quality of care rendered to patients undergoing surgical procedures. For instance, a study has reported that high stress levels among surgical teams are linked to decreased job satisfaction, increased burnout, and poor surgical outcomes, which ultimately compromise patient safety[12].

The role-specific stress patterns among the team members highlight the need for tailored interventions to address the unique challenges faced by different team members. Studies have suggested that ergonomic redesign of the OT setting, implementation of structured communication protocols, and supportive leadership practices can mitigate environmental stress, improve teamwork, and enhance both team members' well-being and patient safety[13-14].

Workplace stress among surgical teams has been extensively examined in high-income countries; however, limited research addresses its prevalence and consequences in low- and middle-income settings such as Nigeria. Most of the tertiary hospitals in Nigeria experience persistent challenges, including chronic understaffing, insufficient infrastructure and resources, equipment failures, and unreliable electricity supply. These conditions are likely to intensify the influence of organizational and environmental stressors on surgical teams relative to those in better resourced health systems.

Despite increasing recognition of work-related stress in Nigerian healthcare, existing studies have often focused on specific cadres such as nurses or physicians, or on general hospital environments rather than surgical settings. To our knowledge, no prior study in Nigeria has simultaneously examined both organizational and environmental stressors among surgical teams and linked them to team performance and patient safety using validated tools. This study addresses the gap by applying the NIOSH Generic Job Stress Questionnaire, adapted for the Nigerian setting, to provide new evidence that can guide interventions to strengthen occupational health, improve team performance, and promote patient safety in resource-constrained hospitals. Thus, this study is to investigate the effect of organizational and environmental stress on surgical team performance and patient safety in a northwest Nigerian tertiary hospital.

METHODS

Study Setting, Design, and Population

This study was conducted at the Ahmadu Bello University Teaching Hospital (ABUTH), Zaria, located in Shika-Zaria, Kaduna State. ABUTH offers all three tiers of healthcare services, as well as training and research. The hospital provides a wide range of services, including general outpatient care, 24-hour accident and emergency services, and inpatient medical and surgical care. The study employed a cross-sectional descriptive design and the population of the study included 45 consultants, 97 resident trainees, and 47 nurses (189).

This study is based on the secondary use of data originally collected to assess occupational stress among team members between March 24 and April 15, 2020. This approach was taken to maximize existing data resources and enable a focused investigation of organizational and environmental stressors in surgical teams. However, reliance on secondary analysis presents certain limitations: the data were not specifically tailored to all the research questions examined in this study, which may restrict the depth of interpretation and limit the generalizability of the findings.

Sample Size and Sampling Technique

The sample size was calculated using Yamane's formula, and participants were drawn through stratified sampling to ensure representation of three groups: consultants (surgeons and anaesthesiologists), resident doctors, and perioperative nurses (including nurse anaesthetists). From these strata, 177 eligible surgical team members were proportionately recruited using random balloting.

Eligibility was limited to permanent or contracted surgical team members with at least six months' operating room experience. Interns, students, those on temporary rotations, individuals with less than six months' experience, or those with prior stress-related diagnoses were excluded.

Tools and Methods of Data Collection

Data were collected using a self-administered questionnaire comprising three sections: socio-demographics, stress-contributing factors, and perceived stress outcomes. The tool was adapted from the National Institute for Occupational Safety and Health (NIOSH) Generic Job Stress Questionnaire [15] and the Perceived Stress Scale (PSS) [16], reviewed by experts in surgery and perioperative nursing, and pilot tested among 15 surgical staff in a similar tertiary hospital. Minor modifications ensured contextual relevance. Reliability was confirmed with a Cronbach's alpha of 0.89.

Items were rated on a five-point Likert scale (0 = strongly disagree to 5 = strongly agree) with a benchmark mean of 2.5. To minimize bias, data collection was anonymous and supported by two trained perioperative nurse research assistants.

Participants were informed about the study objectives, and completion of the questionnaire required an average of 15 minutes during the data collection period between March 24 and April 15, 2020.

Data Analysis

After retrieving all the questionnaires, the data were cleaned, coded, and entered into IBM SPSS version 26.0 for statistical analysis. Data accuracy and reliability were ensured through frequency checks and correction of entry errors. Descriptive statistics were used to summarize variables with frequency and percentage tables. Chi-square test was conducted to examine associations between dependent and independent variables. Predictor variables that showed statistically significant associations at the bivariate level, as well as those identified from prior literature as theoretically relevant, were entered into the multivariate model. Multiple regression analysis was then performed to identify independent predictors of stress. The level of statistical significance was set at $p < 0.05$. Odds ratios (OR) with 95% confidence intervals were reported, where ORs greater than 1.0 indicated an increased likelihood of stress relative to the reference category, and ORs less than 1.0 indicated a decreased likelihood. Both significant and non-significant findings are presented and interpreted in line with the regression tables to ensure consistency and transparency.

Ethical Consideration

Ethical approval for the study was sought and obtained from the Health Research Ethics Committee of Ahmadu Bello University Teaching Hospital (ABUTH), Zaria, with reference number ABUTH 954524802 (Dated 16th March, 2020). Written informed consent was obtained from all participants and participation in the study was entirely voluntary. Participants in the study were assured that any information provided would remain strictly confidential and all the participants were identified. To safeguard confidentiality, questionnaires were anonymized with unique codes instead of personal identifiers, and data were stored securely with access restricted to the research team. Only participants who consented were included in the study, ensuring full adherence to ethical research standards.

RESULTS

A total sample size of 177 respondents successfully participated in the study and were included in the final analysis.

Table 1: Socio-demographic Data of the Respondents

Variable	Category	Frequency	Percentage
Gender	Male	106	59.9
	Female	71	40.1
Ethnicity	Hausa/Fulani	48	27.1
	Yoruba	25	14.1
	Igbo	20	11.3
	Others	84	47.5
Religion	Islam	95	53.7
	Christianity	82	46.3
Cadre	Doctor	116	66.3
	Nurse	59	33.7

Variable	Category	Frequency	Percentage
Highest Qualification	PhD	1	0.6
	Fellowship	39	22.0
	MSc/Masters	22	12.4
	PGD	15	8.5
	BSc.	44	24.9
	HND/Equivalent	5	2.7
	Diploma	7	4.0
	Others	38	21.5
	No response	6	3.4
Marital Status	Single	60	33.9
	Married	110	62.1
	Separated	1	0.6
	Divorcee	5	2.8
	Widow	1	0.6
Mean Age		**39.4**	**SD = 7.8**
Mean Weekly Hours Worked		**53.0**	**SD = 23.6**

As shown in Table 1, most respondents were male (59.9%) with diverse ethnic backgrounds, including Hausa/Fulani (27.1%), Yoruba (14.1%), Igbo (11.3%), and others (47.5%). Over half identified as Muslim (53.7%), while 46.3% were Christian. Medical doctors formed the majority of the sample (66.3%), compared to nurses (33.7%). In terms of education, 24.9% held bachelor's degrees, 22.0% fellowships, and very few had PhDs (0.6%). Most participants were married (62.1%), with 33.9% single and a small minority separated, divorced, or widowed. The mean age of respondents is 39.4 years with a standard deviation (SD) of 7.8, indicating a moderately diverse age distribution and the mean of weekly call hours worked is 53.0 hours, with an SD of 23.6, suggesting a broad range of weekly working hours, likely reflecting differing job roles or personal circumstances within the sample.

Table 2: The Level of Stress among Surgical Team Members

Level of stress	Frequency	Percentage
Lack of stress	5	2.8%
Low stress	21	11.9%
Moderate stress	115	65.0%

Severe stress	36	20.3%

The findings on the level of stress (see Table 2) among the participants indicate that the majority of the team members (65.0%) are exposed to a moderate level of stress, followed by (20.3%) who experience severe stress and (12%) low stress. Only a small percentage (3%) reported a lack of stress. This suggests that most respondents perceived their work has been stressful, with a significant portion facing moderate to severe levels of stress, highlighting the need for interventions aimed at managing stress among the team members.

Table 3: Organizational, Interpersonal and Environment Stressors

Stressors	StrA*	A*	N*	D*	StrD*	Mean ± SD	Rank
Organizational Related							
Job policy and procedure	31	134	8	3	1	4.08±0.58	1
Lack of promotion	26	128	14	7	2	3.96±0.69	2
Lack of availability of supplies and equipment	52	96	22	5	2	4.08±0.79	1
Cumulative mean						**4.038**	
Interpersonal Related							
Lack of peer support	34	107	22	10	4	3.89±0.86	4
Lack of supervisors support	29	117	19	10	2	3.91±0.77	3
Communications problem	43	104	23	5	2	3.54±0.41	1
Lack of balance between personal and work life	49	90	24	10	4	3.96±0.92	2
Cumulative mean						**3.945**	
Working/physical environment Related							
Poor housekeeping of the theatre	38	109	13	14	3	3.93±0.87	8
Lack of equipment to work with	51	95	26	1	4	4.06±0.81	3
Space for work	40	98	22	14	3	3.89±0.90	10
Safety of your personal belongings	39	103	23	12	0	3.96±0.79	7
The level of noise in the theatre	34	99	28	15	1	3.85±0.85	11
The level of lightning in the theatre	42	92	27	14	2	3.89±0.89	10
The temperature (cooling system) of the theatre	46	93	21	12	5	3.92±0.95	9
Risk for injury	51	97	25	4	0	4.10±0.72	2
Exposure to dangerous chemicals	60	77	24	11	5	3.99±0.99	6
The nature of the convenience	56	97	19	4	1	4.15±0.74	1

The nature of the changing room	50	96	19	10	2	4.03±0.85	4
Safety in the theatre	55	88	19	9	6	4.00±0.97	5
Cumulative mean						**3.981**	
Aggregate mean %	**79.8%**						
Aggregate mean score	**3.99**						
t=-statistic = 36.49, p-value = 0.00075 = Statistically significant							

Note. StrA = Strongly Agree; A = Agree; N = Neutral; D = Disagree; StrD = Strongly Disagree.

Table 3 provides an overview of various organizational, interpersonal, and working environment-related factors contributing to stress, as assessed by respondents. The organizational-related stressors, such as job policy and procedure (mean = 4.08) and lack of promotion (mean = 3.96), are ranked highly, suggesting that structural and policy-related issues within the workplace are significant sources of stress. Cumulative mean for organizational-related stressors is 4.038, indicating that, overall, organizational factors tend to be a major contributor to stress.

Among the interpersonal-related stressors, lack of peer support (mean = 3.89) and lack of supervisor support (mean = 3.91) are notable contributors to stress, ranked 4th and 3rd, respectively. The cumulative mean for interpersonal-related stressors is 3.945, reflecting the importance of support systems at work in affecting employees' stress levels. Communication problems and lack of work-life balance also contribute, with means of 3.85 and 3.96, respectively, pointing to issues in relationships and personal life balance as significant stress factors.

Environmental stressors showed notable effects on participants' stress levels. The highest-ranked factors were workplace convenience (mean = 4.15) and risk of injury (mean = 4.10), underscoring safety and suitability of the work environment as key concerns. The cumulative mean score (3.98) further highlights the significant role of the physical environment in stress generation. Additional contributors included poor housekeeping, inadequate equipment, and unfavourable conditions such as noise and temperature, each with varying levels of impact.

The finding of the independent samples t-test shows that the aggregate mean stressor score was statistically significantly (t = 36.49, $p < 0.001$), which is higher than the neutral midpoint of 3 on the Likert scale. These findings suggested that the respondents in this study perceived the environmental and institutional stressors as impactful.

Table 4: Outcomes of Stress among the Surgical Team Members

Outcomes	StrA*	A*	N*	D*	StrD*	Mean ± SD	Rank
Interpersonal conflict	43	104	18	10	2	3.99±0.82	4
Poor performance	29	113	22	12	1	3.89±0.78	5
Low motivation	42	109	14	11	1	4.01±0.79	3
Poor job satisfaction	43	107	16	10	1	4.02±0.78	2
Poor client/patient outcome	39	91	32	14	1	3.86±0.89	7
Sleeping disorders	42	88	32	14	1	3.88±0.88	6
Increase medical errors	43	87	29	15	3	3.86±0.94	7
Increased health workers turnout	43	82	27	17	8	3.76±1.07	10

Job absenteeism	33	83	34	18	9	3.64±1.06	11
Musculoskeletal pains and fatigue	53	96	19	8	1	4.09±0.79	1
High blood pressure	40	97	22	17	1	3.89±0.88	5
Depression	41	88	25	22	1	3.83±0.95	9
Anxiety	33	104	20	19	1	3.84±0.87	8
Aggregate mean %	**77.78%**						
Aggregate mean score	**3.889**						
t= **19.86**, df=8, p < **0.0001t = Statistically significant**							

Note. StrA = Strongly Agree; A = Agree; N = Neutral; D = Disagree; StrD = Strongly Disagree.

Table 4 above shows the findings on the outcome of stress among the surgical team members. Musculoskeletal pains and fatigue have the highest outcome of work related stress as this item attracted the highest mean and SD value of4.09±0.79, poor job satisfaction has the second rated highest value with mean and SD value of 4.02±0.78 while job absenteeism has the lowest value of mean re and SD value of 3.64±1.06.

The one-sample t-test results in Table 4 further indicated that the mean outcome score was statistically significantly higher than the neutral point $t(8) = 19.86$, $p < 0.001$. This implies that workplace stressors exert a substantial and consistent antagonistic effect on team members' work performance, well-being, and the quality of care to patients.

Table 5: Multiple regression analysis between years of experience, call hours and level of work related stress among surgical team members

Variables	Coefficient	Beta	t-cal	Sig.
Years of experience	-.087	-.100	-1.144	.254
Call hours per week	.013	.067	.870	.385
Constant	**27.336**	**-**	**12.29**	**.000**
R=0.211				
R^2 =0.044				
R^2 (adj) = 0.028				
F- ratio = 2.80				.064

The results in (Table 5) show that the regression model analysis established a correlation coefficient of R = 0.211, which indicates a weak positive relationship between the overall set of predictors and the outcome variable. The coefficient of determination ($R^2 = 0.044$) showed that 4.4% of the variance in the dependent variable is explained by the two predictors, while the adjusted R^2 (0.028) suggested that, after adjusting for the number of predictors, the model still established only 2.8% of the variance.

The *F* ratio of (2, 174) = 2.80 with a significance value of $p = 0.064$ indicates that the model is not statistically significant at the 0.05 level. This means that, years of experience and weekly on call hours do not significantly predict the dependent variable in this sample while, independently, years of experience ($\beta = -0.100$, $p = 0.254$) and call duty hours per week ($\beta = 0.067$, $p = 0.385$) were not statistically significant predictors, as the p-values were greater than the 0.05 threshold.

DISCUSSION

This study found that most surgical team members in a Nigerian tertiary hospital reported moderate to severe workplace stress, with organizational and environmental stressors such as unclear policies, inadequate supplies, poor housekeeping, and risk of injury emerging as the most significant. These findings highlight that in this setting, institutional conditions rather than demographic characteristics drive stress, underscoring the decisive influence of the work environment.

Compared with high-income countries where stress is often linked to litigation risk, advanced technologies, or complex case management [8, 14], our results show that Nigerian teams contend with systemic stressors such as erratic utilities, inadequate staffing, and equipment breakdowns. These contextual realities amplify the negative impact of stress on patient safety, as surgical delays, fatigue, and reduced precision are more likely in resource-constrained environments. Similar observations have been noted in other LMICs, including Ghana and Ethiopia, was limited resources intensified stress among surgical staff [17, 18], but the present study extends this evidence by specifically examining both organizational and environmental stressors in Nigeria.

The practical implications are clear. Simple, low-cost interventions can help reduce stress in this environment. Regular equipment maintenance, structured staff rotation, and improved housekeeping are realistic steps at the facility level. Organizational changes, such as clearer task delegation, supportive leadership, and structured communication protocols, could further ease stress and strengthen team performance. These strategies are particularly suited to resource-limited hospitals was financial investment is constrained but organizational reform is feasible.

Our findings also align with the Job Demand–Control (JDC) model, which emphasizes that stress arises when high job demands are coupled with low decision-making autonomy [11]. In this study, surgical teams faced long working hours, heavy caseloads, inadequate supplies, and unsafe environments (high demands) while having little control over resource allocation or institutional policies (low control). This imbalance likely contributed to the moderate to severe stress levels reported. Enhancing staff autonomy, redistributing workload, and strengthening peer and supervisory support systems could help rebalance demand and control, thereby improving both staff wellbeing and patient safety.

The study also revealed negative stress outcomes, including fatigue, musculoskeletal pain, and diminished job satisfaction, consistent with evidence linking occupational stress to absenteeism, medical errors, and poor safety culture [12, 22]. Importantly, these effects were consistent across demographic groups, reinforcing that systemic factors, not individual resilience alone, are the key drivers of stress in Nigerian surgical practice.

The implications for practice and policy are therefore significant. Hospital administrators should prioritize ergonomic improvements in operating theatres, adequate staffing and supply chains, and structured peer support. At the policy level, investment in occupational health services, stress monitoring, and leadership training would be critical. These interventions are practical within the Nigerian context and have broader relevance for LMICs facing similar challenges.

This study has some limitations that should be considered when interpreting the findings. It relied on secondary analysis of data originally collected for a broader investigation of occupational stress, which may not have been specifically tailored to address all the research questions examined. This limits the depth of interpretation and may affect generalizability. Nonetheless, the use of existing data allowed for the timely assessment of organizational and environmental stressors in surgical teams during a critical period. The use of validated tools, an adequate sample, and application of the JDC framework strengthen the reliability of the findings. Future studies should adopt longitudinal designs and evaluate the effectiveness of targeted interventions in reducing stress and improving patient safety.

CONCLUSION

This study revealed the levels of stress among surgical team members in a tertiary hospital, with most participants reporting moderate to severe stress levels. This study also shows that organizational and environmental stressors, such as inadequate supplies, unsafe conditions, and unclear policies, are the major drivers of stress among surgical teams in a Nigerian tertiary hospital. These findings highlight the need for locally feasible interventions to reduce stress and strengthen patient safety in resource-limited surgical settings.

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