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ASSESSMENT OF HEALTH EMERGENCY MITIGATION STRATEGIES OF HEALTH INSTITUTIONS IN BAYELSA STATE

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Abstract

This paper assessed the health emergency mitigation strategies for health institutions in Bayelsa State, Nigeria. The aims were to identify the common health hazards in institutions across Bayelsa State and to assess the mitigation strategies for public health emergencies in the health institutions in Bayelsa State. Descriptive research design was adopted targeting population of 5,086 health workers, including doctors, nurses, pharmacists, community health officers, medical laboratory scientists, and other relevant staff. 735 health care workers were sampled in the study and distributed across primary, secondary, and tertiary care facilities. Data collection was carried out using structured questionnaire. Descriptive statistics and Chi-square were used for data analyses. Results of descriptive statistics showed that common hazards identified in the health institutions were high workload (often 43.4%, always 24.6%), resource inadequacies (often 31.3%, 36.2% always), and challenging schedules (often 36.2%, always 31.3%). The results on institution-based mitigation strategies revealed that 56.5% of the workers agreed to the availability of institution-based mitigation strategies in their health centers. The results also showed that the availability of HIV-specific post-exposure prophylaxis, as emergency mitigation strategy, was highest among in tertiary facilities (64.4%), followed by 58.3% in secondary facilities and 46.5% in primary facilities, demonstrating a statistically significant difference ($\chi 2$ = 19.12; $p < 0.001$). Similarly, regular staff training was highest in the tertiary facilities (50.7%) and lowest in primary facilities (35.4%), with a significant difference across levels of care ($\chi 2$ = 14.69; $p < 0.001$). Access to PPE (χ^2 = 19.12; p – 0.001) and practice of proper hand-washing technique (χ^2 = 19.12; p – 0.001) were also significantly different across the levels of care. It was concluded that workload, resource inadequacy and schedule problems are common hazards in the health institution and there is substantial level of mitigation strategies available for health emergency situations in the health institutions in Bayelsa state.

Keywords:

Health Emergency, Mitigation Strategy, Health Institutions, Bayelsa State.

1.0 INTRODUCTION

Various global hazards, including infectious diseases, chemical and radiation pollution, natural disasters, wars, and social conflicts, have a significant impact on public health worldwide (Topluoglu et al., 2023; World Health Organisation [WHO], 2023). Society and health institutions are vulnerable to crises, particularly those related to infectious disease epidemics, wars, natural disasters, technical incidents, and other risks. The health consequences of these events may be quite severe without efficient risk management. It is crucial to mitigate these health hazards in order to enhance global health security and strengthen the health system (WHO, 2023). Resilience in the healthcare system against new infectious illnesses may be attained through sustained emergency preparation, efficient response, and mitigation strategies (Augustynowicz et al., 2022).

Prior to the 2014 Ebola outbreak, the health systems in the affected African countries were characterised by weak infrastructure, inadequate funding, a shortage of medical supplies and personnel, and a deficient health information management system and disease surveillance. These factors contributed to the rapid spread of Ebola and hindered response efforts (Dubois et al., 2015). Nigeria has identified essential capabilities in the health sector that must be consistently improved to safeguard its population during widespread epidemics (Nigeria Centre for Disease Control [NCDC], 2017). The COVID-19 pandemic significantly disrupted health service delivery in countries worldwide, affecting patients with non-communicable diseases. To address this, many countries have implemented telemedicine as a mitigation strategy to provide care to these patients. However, this service is only available in 42% of low-income countries (WHO, 2020).

There are various hazards in the health sector affecting the health of health workers, patients, and visitors. In a literature review on occupational hazards among health care workers, Mossburg et al. (2019) reported that health care workers are exposed to high levels of blood-borne pathogens due to needlestick injuries. Similarly, a cross-sectional study on factors associated with occupational needlestick and sharp injuries among hospital health care workers in Bale Zone, Southeast Ethiopia, reported that many participants were exposed to blood-borne pathogens through needlestick injuries, with syringe needles as the leading cause (Bekele et al., 2015).

Other studies have also identified hazards in the health care setting, as seen in a quantitative cross-sectional study on occupational health hazards among health care workers in Kampala, Uganda. The results showed that there are biological and non-biological hazards, and the predictors of these experiences are not wearing personal protective equipment, working overtime, and job-related pressure. Control measures identified to mitigate hazards were separating medical and non-medical waste and providing personal protective equipment (Ndejjo et al., 2015).

Orme et al. (2015) reported in their study on occupational health hazards of working in an interventional laboratory, using an electronic survey at the Mayo Clinic, that participants involved in procedures using radiation had musculoskeletal pain that varied significantly by job type. A study conducted using a systematic literature review on occupational health hazards prevailing among health workers in developing countries also showed that blood-borne diseases, Musculoskeletal problems, exposure to latex causing allergy, violence, and work-related stress are occupational health hazards affecting health care workers in the health care setting (Owie & Apanga, 2016). Apart from exposure to biological hazards through needle prick, health care workers are also faced with hazards of workplace violence and psychological hazards. A systematic literature review on the aftermath of workplace violence among health care workers identified seven categories of consequences of workplace violence: physical, psychosocial,

emotional, work functioning, relationship with patients/ quality of care, and Psychological (post-traumatic stress, depression) (Lanctot & Guay, 2014).

Another systematic literature review on the prevalence of occupational exposure and its influence on job satisfaction in large-scale cross-sectional designs in China also identified Psychological and organizational hazards as the most common among healthcare workers (Shi et al., 2020). Further studies have supported the view that biological and psychological hazards are the most common in the health care setting. Ayuda et al. (2015), in a study on self-reported environmental health risks among nurses working in the hospital surgical unit, used a cross-sectional design in a large teaching hospital and identified biological and psychological risk factors as the highest, with moderate levels of physical, chemical, ergonomic, and radiation risk factors.

Although hazards in the health care setting are evident, some workers are unaware of them. This was observed in a descriptive empirical study conducted in Tirunelveli city, Tamil Nadu, India, on sanitary workers' awareness in the hospital. Most sanitary workers were unaware of the hazards of not wearing personal protective equipment (Raja, 2019). Some empirical findings on mitigation strategies revealed the following: Mosssburg et al. (2019) discovered that needle prick injuries expose health care workers to a significant risk of bloodborne infections. A similar study examined factors associated with needlestick and sharp injuries among hospital workers in the Bale Zone, Southeast Ethiopia. It found that syringe needles were the main reason many of the participants were exposed to blood-borne pathogens through needle stick injuries (Bekele et al., 2015).

Other studies have found dangers in the health care context, as evidenced by quantitative cross-sectional research on occupational health hazards among health care professionals in Kampala, Uganda. The findings revealed biological and non-biological dangers, and predictors of these events include failure to wear personal protective equipment, working overtime, and job-related stress. Control strategies suggested to mitigate risks included separating medical and non-medical waste and providing personal protective equipment (Ndejjo et al., 2015).

Orme et al. (2015) in their study on the occupational health hazards of working in an interventional laboratory used an electronic survey of the Mayo Clinic to conclude that individuals involved in radiation treatments experienced musculoskeletal discomfort, which varied significantly depending on the type of job. A systematic literature review of occupational health hazards affecting health care workers in developing countries revealed that bloodborne diseases, musculoskeletal problems, exposure to latex causing allergy, violence, and work-related stress are occupational health hazards affecting health care workers. Aside from medical threats caused by needle pricks, healthcare professionals confront workplace aggression and psychological concerns.

A systematic review of literature on the aftermath of workplace violence among health care workers has identified seven types of consequences: physical, psychosocial, emotional, work functioning, relationship with patients/quality of care, and psychological (post-traumatic stress disorder, depression) (Lanctot & Guay, 2014). Another major study in China examined the effects of occupational exposure on job satisfaction using large-scale cross-sectional designs. It found that psychological and organizational risks were the most common among health care professionals (Shi et al., 2020).

Further research has reinforced that biological and psychological dangers are among the most prominent in healthcare. Ayuda et al. (2015) used a cross-sectional design to look at how nurses working in the surgical unit of a large teaching hospital felt about the health risks that came from

their work environment. They found that biological and psychological risk factors were the highest, followed by moderate physical, chemical, ergonomic, and radiation risk factors. Although there are obvious risks in healthcare, some employees are unaware of them. A descriptive empirical study in Tirunelveli city, Taminadu, India, on the awareness of sanitary workers in the hospital, revealed that most of them were unaware of the dangers of not wearing personal protection equipment.

Managing health hazards and risks is essential for national and global health security. It is crucial for meeting the Sustainable Development Goals (SDGs), especially in working towards universal health coverage and targeting 3D to strengthen all countries' capacity (WHO, 2019). Health systems are accountable for mitigating risks and minimising the impact of regular and emergency events caused by various hazards. Aside from addressing infectious disease risks and controlling outbreaks, the health sector plays a crucial role in avoiding and reducing the health impacts of crises caused by sector-specific hazards. Countries must enhance their disaster risk management skills by implementing measures for prevention, mitigation, readiness, response, and recovery. It is crucial because disease outbreaks in our interconnected world may quickly travel from local areas to cities and across borders to neighbouring nations. Local governments, states, and nations need the expertise and capacity to promptly halt the spread of diseases and eliminate their sources (Centre for Disease Control and Prevention [CDC], 2021). Evaluating public mitigation measures for health disasters can help monitor and enhance the health system's capacity and capabilities. This study aims to assess mitigation strategies in health institutions in Bayelsa State. It determines the common health hazards in institutions across Bayelsa State and also assessed the mitigation strategies for public health emergencies in the health institutions in Bayelsa State.

2.0 MATERIALS AND METHODS

2.1 Research Design

This study used a descriptive survey to assess emergency preparedness in the primary, secondary, and tertiary health institutions across Bayelsa State. A descriptive comparative survey was chosen to identify the characteristics of variables in preparedness response and mitigation strategies for public health emergencies clearly. It was used to compare the preparedness level of the different health system tiers. This provides an in-depth understanding of the preparedness status of public health emergencies in Bayelsa State. The study involved collecting information from key informants and health care personnel in the health facilities using a checklist and structured interview questionnaire.

2.2 Study Area

The study area of this research is focused on the Bayelsa State Health institutions. Bayelsa State is one of the States in the Niger Delta, which is biodiverse with mangroves and rainforest that provide sequestration of carbon, supporting the variety of plants and animal life found in the region. Bayelsa is a state in the Niger Delta region in the southern part of Nigeria. It lies between Delta and Rivers State, with its capital in Yenagoa. The Ijaw language is primarily spoken with dialects such as Kolukuma, Mein, Bomu, Epie-Atisa, Nembe, and Ogbia. The official language of Bayelsa State is English. General Sani Abacha's military government created the state out of the old Rivers State on the first of October, 1996. Its name was derived from the first few letters of the names of the major local government areas from which it was formed - Brass LGA (BALGA), Yenagoa (YELGA), and Sagbama (SALGA). Hence, BAYELSA was derived from the letter’s BA + YEL + SA. Bayelsa State has one of Nigeria's largest crude oil and natural gas

deposits. As a result, the state's petroleum production is extensive. However, most Bayelsans live in poverty. Bayelsa State lies in 9,415.8 square kilometres, and the Nigeria National Census of 2006 estimated the State population to be 1,704,515, accounting for 1.2% of the country's total population figure. Bayelsa State is located in a Latitude of 40 15' North to 5 o 23' South and a longitude of 05 o 22' West to 06 o 45' East. It is on longitude 6^0 degrees 05'' East and Latitude 4^o degrees 45'' North (Bayelsa State Overview, n.d.).Bayelsa State has three levels of health care as contained in the National health care system namely; Tertiary health care level with highly specialized care (Niger Delta University Teaching Hospital Okolobiri and Federal Medical Centre Yenagoa) all situated in Yenagoa Local Government Area of the State, Secondary Health care facilities spread across all the Local Government Areas and Primary Health care facilities distributed around all the wards in each of the local Government Areas with at least one functional health facility in each ward.

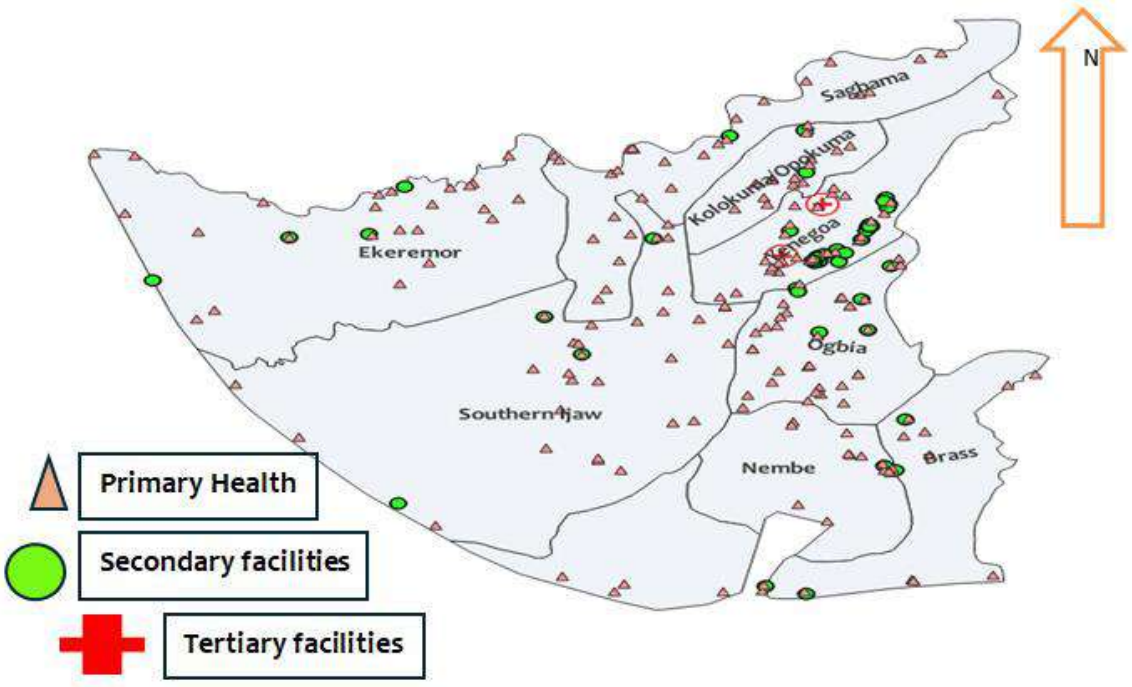

Figure 1 Map of Bayelsa State showing the distribution of health facilities.

2.3 Population for the Study

The target population of this study consists of key health personnel from the tertiary, secondary, and primary health facilities in Bayelsa State. The estimated population of the study is 5,086. An actual figure could not be obtained, hence an estimated figure from the assessment done before the Bayelsa Health summit of 2021 was used (Table 1). Health facilities listed in the study were selected from 189 viable tertiary, secondary and 105 functional primary health facilities in the eight local government areas of Bayelsa State (Table 2)

Table 1: Estimated Distribution of different healthcare professionals in Bayelsa State

S/N	Cadre of Health Care Personnel	Population
1	Doctors	730
2	Nurses/Midwives	1116
3	Pharmacists	30
4	Pharmacy Technicians	39
5	Lab. Scientists	35
6	Medical Laboratory Technicians	20
7	Lab. Assistants	42
8	CHOs	28
9	CHEWs	244
10	JCHEWs	155
11	Dental Technicians	12
12	Others	135
	Total for State-Owned Facilities	2,586
13	Estimated Total for FMC Yenagoa	2,500
	Grand Total	**5,086**

Source: Corona management, Bayelsa State Ministry of Health Pre-Health Summit Situation Analysis (2021)

Table 2: Distribution of public health facilities in Bayelsa State.

S/N	LGA	Primary	Secondary	Tertiary	Total
1	Brass	11	2	0	13
2	Ekeremor	24	5	0	29
3	Yenagoa	24	6	2	32
4	Nembe	18	3	0	21
5	Ogbia	20	4	0	24
6	Sagbama	23	3	0	26
7	Kolokuma-Opokuma	8	3	0	11
8	Southern Ijaw	29	4	0	33
	Total	**157**	**30**	**2**	**189**

2.4 Sample Size Determination

The sample size for this study was calculated using the formula for estimating a simple proportion in a population, given below:

$$n = \frac{Z^2 \, X \, P \, X \, Q}{d^2} \qquad (3.1)$$

where n is the minimum sample size needed in this study, Z is the standard normal deviate at 95% confidence interval, which is given as 1.96, and P is the prevalence of the disease or health event of interest in the population. For this study, a prevalence of 50% (0.5), which is expected to give a minimum sample size, is assumed while Q is the complementary prevalence given as 1 – P (1 –

0.5 = 0.5) and d is the margin of error allowable in the study (level of precision) taken as 5% (0.05). Substitution is shown below:

$$n = \frac{1.96^2 \, X \, 0.5 \, X \, 0.5}{0.05^2}$$

$$n = n = 384$$

Hence, a minimum sample size of 384 persons at the primary and secondary levels of care is needed for this study. Adjusting the sample size for non-response, using a non-response rate of 10% further increases the sample size to 422, that is, the summation of 10% of 384 (38) and the minimum sample size. However, the total population of health workers in this study, is a finite population of less than 10,000 persons, the formula for adjusting a finite population less than 10,000 was also applied as shown below:

$$n_f = \frac{n}{1+\frac{n}{N}} \quad (3.2)$$

n_f is the new sample size for the finite population, n is the calculated sample size (422) and N is the total population size (2,586 for the primary/secondary levels and 2500 for tertiary level of care).

For the primary/secondary level

$$n_f = \frac{422}{1 + \frac{422}{2584}}$$

$$n_f = 362 \, persons$$

For the tertiary level of care

$$n_f = \frac{422}{1 + \frac{422}{2500}}$$

$$n_f = 360 \, presons$$

Hence, the study involved 362 health workers at the primary/secondary level of care and 360 health workers at the tertiary level of care in the State.

2.6. Sample and Sampling Techniques

A multistage sampling technique was adopted for the selection of participants this study. The study was conducted in all the Local government areas of the State, to ensure a good representation of the State's health emergency preparedness and mitigation strategies at all levels of care delivery.

Stage I: Selection of Wards/health facilities at the Local Government Area (LGA) level; Five wards were selected from each LGA by simple random sampling (balloting), making a total of 40 wards to be included in the study out of the 105 administrative wards in the State. This amounts

to 38% of the total primary health facilities in the State which is considered representative enough. The functional public health facilities in each of the selected wards in the local government area of the State would be drafted into the study. Two secondary health facilities each would be selected from the 8 LGAs of the state by simple random sampling. The two tertiary public health facilities in the state will also be drafted into the study.

Stage II: **Selection of participants from the health facilities for the study;** There are 362 participants recruited from 40 primary health care centres and 16 secondary health centres. A proportionate allocation of participants was adopted to recruit participants at the primary and secondary levels of care. The total includes 56 primary and secondary health facilities. number to be recruited from the primary level by proportionate allocation is as shown below:

$$Subgroup\ sample\ size = \frac{Number\ in\ subgroup}{Total\ numebr\ of\ group}\ X\ sample\ size \quad (3.3)$$

For the primary level of care

$$Subgroup\ sample\ size = \frac{40}{56}\ X362$$

$$Subgroup\ sample\ size = 258.6$$

Approximately 259 health workers were recruited from the 40 public primary health facilities that would be recruited for the study.

For the secondary level of care

$$Subgroup\ sample\ size = \frac{16}{56}\ X362$$

$$Subgroup\ sample\ size = 103.4$$

Approximately 103 health workers were recruited from the 16 secondary public health facilities for the study. Stratified random sampling was adopted in the health facilities to ensure that all cadres of health care providers, including doctors, nurses, pharmacists, medical laboratory scientists, health attendants, and other relevant health care workers, were involved in the study.

For the tertiary centres, participants from the Federal Medical Centre (FMC) and the Niger Delta University Teaching Hospital (NDUTH) were recruited proportionately to the population of health workers in each centre. The selection of participants from the centres was done using the stratified sampling technique to ensure that all cadres of health care providers were recruited in the study.

2.7. Methods and Instrument of data collection

Eight research assistants were recruited for the data collection, each representing the focal person in the eight LGAs of Bayelsa state during the Study. They were trained on the study's objectives, purpose and benefits to participants and the entire health system in Bayelsa state. The training includes obtaining informed consent and ensuring that other medical research ethics principles are upheld. The selection technique was reviewed, and the number of participants recruited from each

LGA and at the three levels of health care delivery would be communicated. The research assistants also review the questionnaire during the training to understand the responses to each question in the study tools. Role-plays were conducted between the research assistants to ensure that the procedures for administering the questionnaire were well understood. The role-play also allowed the research assistants to be corrected in any area where there might be errors in data collection.

At the commencement of data collection in each facility, the most recent staff nominal roll serve as the sampling frame. The professional cadres are the strata from which a simple random sampling technique on each research day selected participants. After the selection, each eligible participant was briefed on the study objectives, benefits, and procedure to obtain informed consent. 794 copies of the study instruments (398 for primary/secondary healthcare facilities, and 396 for tertiary healthcare facilities) were distributed. Each trained research assistant distributed copies of research instrument (65-100 copies) according to number of health facility his/her apportion LGA. Eligible participants were allowed to ask questions and seek clarifications, after which written informed consent was obtained from those willing to participate, thus recruiting them for the study. Thereafter, the study questionnaire was administered to the recruited health workers. In all, a total of 794 copies of the study instruments that were distributed, a total of 761 were successfully retrieved, of which only 735 (primary facility=243; secondary facility=127, tertiary facility=365) were correctly filled, hence, valid for computation of the study results.

The instruments for data collection in this study were a structured questionnaire. The study questionnaire is made up of three sections; section A contain respondents' profile, section B explored common hazard in the health sector, while Section C seeks to uncover the mitigation strategies for public health emergencies among health workers. The responses to items on the questionnaire are a 5-point Likert scale response namely strongly agree–5; Agree–4; disagree–2, strongly disagree–1, and undecided–3.

2.8 Validation and Reliability testing of the study Instrument

Validation and reliability testing were done through expert and peer reviews and pretesting of the adapted study questionnaire. Pretesting was done in 2 primary health facilities in Ahoada West LGA of Rivers state, a suburban LGA close to Bayelsa state. Responses were evaluated from the pretesting and expert/peer review, and based on suggestions and observations, the questionnaire was further modified to improve their validity and reliability in data collection. Reliability of the instrument was ensured by accurate and careful phrasing of each question to avoid ambiguity and leading respondents to an answer. Test and retest were deployed to determine the instrument's reliability, using twenty-five subjects in primary and secondary health facilities in Ahoada West LGA. The instrument was administered twice within an interval of two weeks. Both sets of responses would be scored and analysed. Pearson's Product-Moment Correlation (PPMC) analysis was done, and a reliability coefficient of 0.86 would be considered acceptable. Cronbach's Alpha, a measure of internal consistency, was carried out; a Cronbach's alpha of 0.7 would be considered acceptable. The study tool was subjected to expert/peer review to ensure the content and face validity. The questionnaire was given to peers and supervisors for content validity. Content validity ensures that it is sufficiently comprehensive in seeking the proper range of responses, it is appropriate in terms of space and length, flow of questions, and whether the questions are consistent with the study's objectives.

2.9 Data Analysis

Data collected by the eight research assistants was uploaded to the ODK cloud and aggregated. The ODK form used for the data collection allows real-time data collection monitoring, and submitted forms were easily viewed, and corrections were easily-made in the field where necessary. After ensuring complete and accurate data collection, aggregated data were downloaded from the server into the principal researcher's personal computer for data cleaning and analysis. Data cleaning was done on Microsoft EXCEL software, and a clean dataset was exported into the Statistical Package Social Sciences (SPSS) software version 25 for data analysis. Univariate analysis was carried out by summarising categorical variables using frequencies and percentages and continuous variables using mean and standard deviation or median and interquartile range as appropriate.

The mitigation strategies among health care providers were scored and graded as poor, fair and good based on scores shown in Table 3. The common hazards present in facilities was determined by grouping 'Always' and 'Often' responses as 'Present' and 'Rarely' and 'Never' responses as 'Absent' in the 9 questions of the Section 5 of the questionnaire assessing the presence of common hazards. The frequencies and percentages of the common hazards present in the health facilities were determined to estimate the prevalence of hazards in the different levels of healthcare delivery in the State. The difference in mitigation strategies across the three levels of health care delivery was assessed using the Chi-square test of proportion. The level of significance is set at p-value < 0.05. A criterion mean of 3 was calculated from the five-point Likert scale used in the questionnaire which was used to compute the weighted mean of each question in the questionnaire and the entire items in each set of questionnaires.

Table 3. Grading for facilities mitigation strategies among health care providers.

Study tool/Domain	Number of items	Range of scores		
		Poor	Fair	Good
Level of Mitigation Strategies	22	22 – 65 points	66 – 88 points	≥88 points

3.0 RESULTS AND DISCUSSIONS

3.1: Common health hazards in health facilities in Bayelsa State

Table 4 revealed the frequency of exposure of health care workers to health hazards while working in the public health facilities in Bayelsa State. From Table 5, it is seen that 319 health workers (43.4%), 301 health workers (41.0%), and 266 health workers (36.2%) indicated that they were 'often' exposed to high workload and demand from the job they do, workplace violence, and frustrations due to limited resources, respectively. Only about a tenth of respondents (10.9%) were either 'often' exposed (9.1%) or 'always' exposed (1.8%) to radiation hazards in the workplace (Table 5). About a third of respondents were 'rarely' exposed to blood-borne pathogens (34.3%) or airborne pathogens (32.2%). 'Never' as a response to common hazards was least in response to high workload and job demand (8.4%), while it was highest in response to the radiation exposure question.

Figure 2 shows that the most common hazards reported among health workers in Bayelsa State include high workload (68.0%), frustration due to inadequate resources (67.5%), and unfavorable work schedule (54.8%). In the same vein, the least occurring health hazards were exposure to radiation (10.9%) and exposure to extreme temperature (20.1%).

The findings, indicating that the most common hazards reported among health workers in Bayelsa State include high workloads (43.4% often present, and 24.6% always present), frustration due to inadequate resources (36.2% often present, and 31.3% always present), and an unfavorable work schedule (41.0% often present, and 13.9% always present), exposures to blood-borne pathogens (22.3% often present, and 8.6% always present), reflect a broader trend in healthcare systems, particularly in developing countries. The pressures of high patient volumes, coupled with limited medical supplies and personnel, contribute significantly to occupational stress and burnout

This aligns with findings by Oleribe et al. (2019), who identified insufficient funding and staff shortages as critical factors exacerbating healthcare burdens across sub-Saharan Africa. The Nigeria Centre for Disease Control (NCDC) also highlights the need for improved resource allocation and infrastructure in public health emergency preparedness to mitigate these challenges.

Supporting this, Ndejjo et al. (2015) found that healthcare workers in Uganda face similar occupational hazards, such as biological and non-biological dangers, due to inadequate personal protective equipment and excessive work hours. These challenges increase job-related stress and reduce job satisfaction, ultimately affecting service delivery. Furthermore, Ayuba et al. (2015) noted that while some nurses in Nigeria possess adequate knowledge of emergency preparedness, their capacity to handle emergencies is hindered by workload-induced stress and resource constraints. These findings suggest a need for institutional reforms to improve working conditions, enhance staff well-being, and ensure optimal healthcare delivery.

Conversely, some studies challenge the severity of these occupational hazards, suggesting that while workload and resource constraints are significant, they are not universally overwhelming. For instance, Ogoinja et al. (2020) reported that certain tertiary hospitals in Bayelsa have begun addressing these issues through policy adjustments and resource allocation improvements, resulting in a favorable work environment. Nonetheless, these initiatives remain isolated, and their impact on overall healthcare system resilience is still limited. Therefore, while some progress has been made, comprehensive strategies are necessary to alleviate the hazards faced by health workers, ensuring both their safety and the sustainability of healthcare services.

Table 4: The frequency of occurrence of common hazards in public health institutions in Bayelsa state.

Statement	Response Pattern – Frequency N = 735 (%)					WM	Remark
	Always	Often	Non-Response	Rarely	Never		
Exposure to blood-borne pathogens contracted through contact with infected body fluid through needle prick injury, contact with the mucus membrane, or non-intact skin	63 (8.6%)	164 (22.3%)	42 (5.7%)	252 (34.3%)	214 (29.1%)	3.2	Accepted
Exposure to airborne pathogens through coming in contact with infected patients, such as patients with TB, COVID-19, and	56 (7.6%)	235 (32.0%)	35 (4.8%)	237 (32.2%)	172 (23.4%)	2.7	Accepted

respiratory infections							
Exposure to extreme temperatures	39 (5.3%)	109 (14.8%)	5 (0.7%)	359 (48.8%)	223 (30.3%)	2.2	Accepted
Exposure to radiation	13 (1.8%)	67 (9.1%)	36 (4.9%)	286 (38.9%)	333 (45.3%)	1.8	Rarely
Workplace violence from patients/patients' relatives.	36 (4.9%)	226 (30.7%)	0 (0.0%)	329 (44.8%)	144 (19.6%)	2.6	Accepted
Exposure to an unfavourable work schedule (shift duty)	102 (13.9%)	301 (41.0%)	5 (0.7%)	233 (31.7%)	94 (12.8%)	3.1	Accepted
Workload and high demand of the job.	181 (24.6%)	319 (43.4%)	0 (0.0%)	173 (23.5%)	62 (8.4%)	3.5	Accepted
Frustrations due to limited resources to perform the tasks.	230 (31.3%)	266 (36.2%)	0 (0.0%)	143 (19.5%)	96 (13.1%)	3.5	Accepted
Poor organizational climate	170 (23.1%)	223 (30.3%)	237 (32.2%)	96 (13.1%)	9 (1.2%)	3.6	Accepted
Weighted Mean						2.9	Accepted

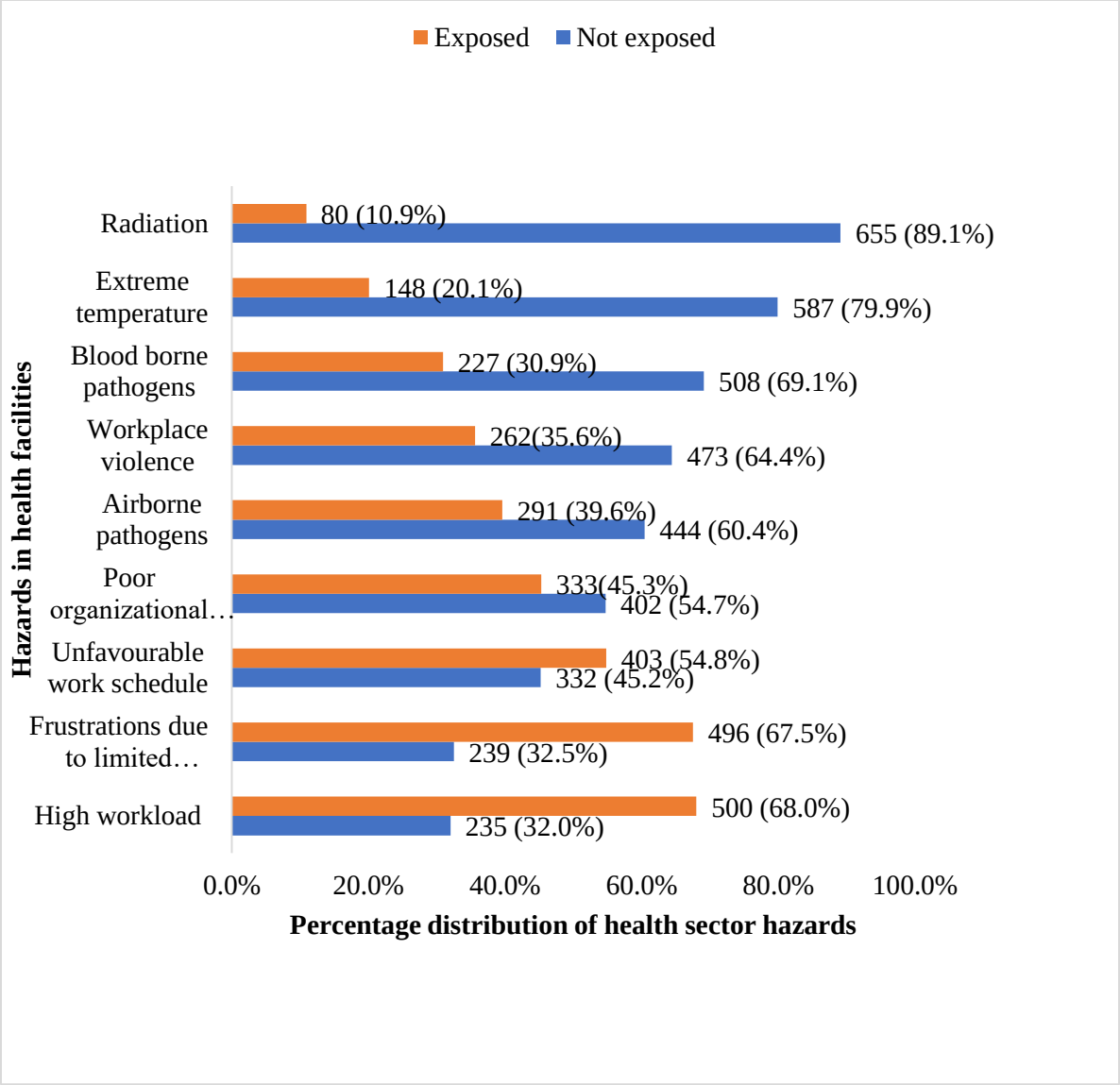

Figure 2: Exposure to common hazards among health workers in the health sector in Bayelsa state.

4.3 Mitigation strategies for public health emergencies in public health institutions in Bayelsa State

Table 6 shows that about a quarter of health care workers 'strongly agree' with the statements that 'HIV-specific post-exposure prophylaxis is available' (25.7%), 31.7% agree that the HIV post-exposure prophylaxis is available, while 19.0% were undecided on the availability of post-exposure prophylaxis. 13.5% disagree, and 9.9% strongly disagree with the presence of HIV post-exposure prophylaxis in the various health facilities. 62 respondents representing 8.4% of the study population strongly agree that they have undergone infection prevention training in their health facilities, and 269 (35.4%) agree that there is regular training on infection prevention in their health facilities. Consequently, 117 (15.9%) were undecided, 187 (25.4%) disagreed, and 109 (14.8%) strongly disagreed that they had been trained in infection prevention in their health

facilities. 40% of Health professionals use personal protective equipment during health emergencies in their facilities (27.6%). Regarding the availability of personal protective equipment, 85 (11.6%) of the health care workers strongly agreed that it is available in their health facilities, while 376 (51.2%) agreed. With 40 (5.4%) being undecided. 167 (22.7%) disagreed, and 67 (9.1%) strongly disagreed that personal protective equipment is available in their health facilities. Regarding proper handwashing technique, 19.3% and 62.3% of respondents strongly agree and agree, respectively, that this is done to ensure infection prevention and control (Table 4.9).

Furthermore, Table 7 shows the responses to institution-based mitigation strategies. About a third of respondents agree that 'Workplace hazard prevention standard operating procedures are visible to all staff in this facility' (35.5%) and 'Engineering controls are in place to protect staff from radiation and temperature extremes in the workplace' (36.3%). Five hundred and fifty-eight health care workers (75.9%) attested that adequate waste segregation and management are practiced regularly in the health facilities. In comparison, 491 health care workers (66.8%) reported that water is available in sufficient quantity at their health facilities (Table 4.9). 600 respondents (81.6%) practice proper hand-washing techniques to prevent infection and control in the different health facilities visited. 43.8% of respondents reported regular staff training for infection prevention and control (Table 7).

Table 8 shows that the availability of HIV-specific post-exposure prophylaxis was highest among respondents in tertiary facilities (64.4%), compared with 46.5% in primary facilities and 58.3% in secondary facilities, demonstrating a statistically significant difference ($\chi 2 = 19.12$; $p < 0.001$). Similarly, regular staff training was highest in the tertiary facilities (50.7%) and lowest in the primary facilities (35.4%), with a significant difference across levels of care ($\chi 2 = 14.69$; $p < 0.001$). Access to PPE ($\chi^2 = 19.12$; p – 0.001) and practice of proper hand-washing technique ($\chi^2 = 19.12$; p – 0.001) were also significantly different across the levels of care. However, they were best in the lowest level of care (primary). Four in every five respondents (82.7%) said access to PPE was available at the primary level of care, 81.9% at the secondary level, while 66.0% reported access to PPE at the tertiary level (Table 8). Proper hand-washing practices were reported by 93.0% and 89.8% at the primary, secondary, and tertiary levels of care, respectively (Table 4.10).

As shown in Table 9, institution-based mitigation strategies available in health facilities in Bayelsa state include practice of effective waste segregation and management (75.9%), availability of water regularly in sufficient quantity (66.8%), control of identified hazard/risks (66.7%) and active case discovery of notifiable diseases of public health relevance (64.1%). Others are regular risk assessment to detect potential dangers which was reported by 31.8% health workers; the visibility of workplace hazard prevention standard operating protocol was reported by 35.5%; and the use of technology in the protection of staff against radiation and heat was reported by 36.3% (Table 4.11).

The visibility of workplace hazard prevention standard operating protocol ($\chi^2 = 19.12$; p – 0.001); use of technology in the protection of staff against radiation and heat ($\chi^2 = 24.33$; p – 0.001); active case discovery of notifiable diseases of public health relevance ($\chi^2 = 20.22$; p – 0.001); availability of water regularly in sufficient quantity ($\chi^2 = 36.84$; p – 0.001); and the presence of adequate holding areas ($\chi^2 = 29.21$; p – 0.001); were significantly different across the three levels of health care delivery (Table 9).

The finding that the mitigation strategies for public health emergencies in Bayelsa State's health institutions are good, readily available, and used across facilities indicates a commendable level

of preparedness. This suggests that health institutions have integrated risk reduction measures into their operational frameworks, which aligns with global best practices. Awuah-Gyawu et al. (2017) emphasize that effective mitigation strategies are crucial for minimizing the impact of health emergencies by reducing exposure to risk and enhancing resilience. The consistent availability of mitigation resources, such as personal protective equipment (PPE), triage protocols, and hazard assessments, indicates that Bayelsa's health sector is proactive in protecting both healthcare workers and patients during emergencies.

However, some studies highlight ongoing challenges in implementing mitigation strategies across healthcare facilities in developing countries, including Nigeria. Oleribe et al. (2019) noted that many sub-Saharan African countries still face significant gaps in emergency preparedness, often due to limited funding and inconsistent enforcement of policies. In Bayelsa, previous experiences with outbreaks such as cholera and COVID-19 have exposed vulnerabilities, particularly in the availability of essential resources during large-scale emergencies. Ogoinja et al. (2020) found that although mitigation frameworks exist, their effectiveness can be compromised by inconsistent resource distribution and inadequate staff training, resulting in varying levels of preparedness across institutions.

Table 6: Response pattern to statement investigating the mitigation strategies for public health emergencies among health workers in the public health institutions of Bayelsa State

Mitigation Strategies	Response Pattern – Frequency N = 735 (%)						
	S/A	A	U	D	S/D	WM	Remark
Personnel-based mitigation strategies							
HIV-specific post-exposure prophylaxis is available.	189 (25.7%)	233 (31.7%)	140 (19.0%)	99 (13.5%)	73 (9.9%)	3.5	Accepted
Staff is regularly retrained on infection prevention and control in this facility.	62 (8.4%)	260 (35.4%)	117 (15.9%)	187 (25.4%)	109 (14.8%)	3.0	Accepted
Personal protective equipment, such as face masks, gloves, gowns, and other items, is available regularly in this facility	85 (11.6%)	376 (51.2%)	40 (5.4%)	167 (22.7%)	67 (9.1%)	3.3	Accepted
Health professionals have access to personal protective equipment such as face masks, gloves, gowns, and other items in this facility	107 (14.6%)	439 (59.7%)	38 (5.1%)	113 (15.4%)	38 (5.2%)	3.6	Accepted
Health professionals utilize personal protective equipment such as face masks, gloves, gowns, and other items made available in this facility during	203 (27.6%)	438 (59.6%)	13 (1.7%)	62 (8.4%)	19 (2.6%)	4.0	Accepted

health emergencies							
Staff in this health facility practice proper hand washing technique to ensure infection prevention and control.	142 (19.3%)	458 (62.3%)	28 (3.8%)	104 (14.1%)	3 (0.4%)	3.9	Accepted
Institution-based Mitigation Strategies							
Workplace hazard prevention standard operating procedures are visible to all staff in this facility	51 (6.9%)	210 (28.6%)	81 (11.0%)	307 (41.8%)	86 (11.7%)	2.8	Undecided
Efforts are made to control the identified hazards/risks in the health facility.	64 (8.7%)	426 (58.0%)	77 (10.5%)	139 (18.9%)	29 (3.9%)	4.5	Accepted
Engineering controls are in place to protect staff from radiation and temperature extremes in the workplace.	34 (4.6%)	233 (31.7%)	172 (23.4%)	229 (31.2%)	67 (9.1%)	2.9	Accepted
A risk assessment is conducted regularly to detect potential dangers in the health facility.	41 (5.6%)	193 (26.3%)	152 (20.6%)	264 (35.9%)	85 (11.6%)	2.8	Accepted
There is active case discovery of notifiable diseases of public health relevance in the health institution.	79 (10.7%)	392 (53.3%)	135 (18.4%)	102 (13.9%)	27 (3.7%)	3.5	Accepted
The principles of effective waste segregation and management are practiced regularly in this facility	148 (20.1%)	410 (55.8%)	52 (7.0%)	111 (15.1%)	14 (1.9%)	3.8	Accepted
Water is available in this facility regularly in sufficient quantity	174 (23.7%)	317 (43.1%)	1 (0.1%)	183 (24.9%)	60 (8.2%)	3.5	Accepted
There is an adequate holding area (arrangement of work area) for patients in this health facility in case of health emergencies	91 (12.4%)	363 (49.4%)	64 (8.8%)	148 (20.1%)	69 (9.4%)	3.4	Accepted
Weighted Mean						**3.5**	Accepted

Table 7: Mitigation strategies (Personnel-based) in the three levels of health care of public health facilities in Bayelsa State

Mitigation Strategies	Total	Level of Care			Chi-square test (pValue)
	Total N=735(%)	Primary N=243 (%)	Secondary N=127 (%)	Tertiary N=365(%)	
HIV-specific post-exposure prophylaxis is available.					
Available	422 (57.4%)	113 (46.5%)	74 (58.3%)	235 (64.4%)	19.12 (0.001)
Not Available	313 (42.6%)	130 (53.5%)	53 (41.7%)	130 (35.6%)	
Staff are retrained on infection prevention and control regularly in this facility.					
Available	322 (43.8%)	86 (35.4%)	51 (40.2%)	185 (50.7%)	14.69 (0.001)
Not Available	413 (56.2%)	157 (64.6%)	76 (59.8%)	180 (49.3%)	
Personal protective equipment such as face masks, gloves, gowns, and other items are available regularly in this facility	s				
Available	461 (62.7%)	169 (69.5%)	76 (59.8%)	216 (59.2%)	7.25 (0.027)
Not Available	274 (37.3%)	74 (30.5%)	51 (40.2%)	149 (40.8%)	
Health professionals have access to personal protective equipment such as face masks, gloves, gowns, and other items in this facility					
Available	546 (74.3%)	201 (82.7%)	104 (81.9%)	241 (66.0%)	25.92 (0.001)
Not Available	189 (25.7%)	42 (17.3%)	23 (18.1%)	124 (34.0%)	

Health professionals utilize personal protective equipment such as face masks, gloves, gowns, and other items made available in this facility					
Available	641 (87.2%)	216 (88.9%)	107 (84.3%)	318 (87.1%)	1.61 (0.446)
Not Available	94 (12.8%)	27 (11.1%)	20 (15.7%)	47 (12.9%)	
Staff in this health facility practice proper hand washing technique to ensure infection prevention and control.					
Available	600 (81.6%)	226 (93.0%)	114 (89.8%)	260 (71.2%)	52.89 (0.001)
Not Available	135 (18.4%)	17 (7.0%)	13 (10.2%)	105 (28.8%)	

Table 8: Mitigation strategies (Institution-based) in the three levels of care of public health facilities in Bayelsa state as reported by study participants

Mitigation Strategies	Total N=735 (%)	Level of Care			Chi-square test (p Value)
		Primary N=243(%)	Secondary N=127(%)	Tertiary N=365 (%)	
Workplace hazard prevention standard operating procedures are visible to all staff in this facility					
Available	261 (35.5%)	103 (42.4%)	44 (34.6%)	114 (31.2%)	7.97(0.019)
Not Available	474 (64.5%)	140 (57.6%)	83 (65.4%)	251 (68.8%)	20.43
Efforts are made to control the identified hazards/risks in the health facility.					
Available	490 (66.7%)	148 (60.9%)	87 (68.5%)	255 (69.9%)	0.58 (0.749)
Not Available	245 (33.3%)	95 (39.1%)	40 (31.5%)	110 (30.1%)	
Engineering controls are in place to protect staff from radiation and temperature extremes in the workplace.					
Available	267 (36.3%)	63 (25.9%)	40 (31.5%)	164 (44.9%)	24.33 (0.001)
Not Available	468	180	87 (68.5%)	201	

	(63.7%)	(74.1%)			(55.1%)	
A risk assessment is conducted regularly to detect potential dangers in the health facility.						
Available	234 (31.8%)	74 (30.5%)	39	(30.7%)	121 (33.2%)	0.58 (0.749)
Not Available	501 (68.2%)	169 (69.5%)	88	(69.3%)	244 (66.8%)	
There is an active case discovery of notifiable diseases of public health relevance in the health institution.						
Available	471 (64.1%)	176 (72.4%)	62	(48.8%)	233 (63.8%)	20.22 (0.001)
Not Available	264 (35.9%)	67 (27.6%)	65	(51.2%)	132 (36.2%)	
The principles of adequate waste segregation and management are practiced regularly in this facility.						
Available	558 (75.9%)	182 (74.9%)	97	(76.4%)	279 (76.4%)	0.21 (0.902)
Not Available	177 (24.1%)	61 (25.1%)	30	(23.6%)	86 (23.6%)	
Water is available in this facility regularly in sufficient quantity						
Available	491 (66.8%)	130 (53.5)	106	(83.5%)	255 (69.9%)	36.84 (0.001)
Not Available	244 (33.2%)	113 (46.5%)	21	(16.5%)	110 (30.1%)	
There is adequate holding area (arrangement of work area) for patients in this health facility in case of health emergencies						
Available	454 (61.8%)	119 (49.0%)	77	(60.6%)	258 (70.7%)	29.21 (0.001)
Not Available	281 (38.2%)	124 (51.0%)	50	(39.4%)	107 (29.3%)	

4.0 CONCLUSION

In conclusion, while the status of mitigation strategies in Bayelsa State health institutions is generally good, readily available, and effectively utilized across facilities, sustaining and improving these efforts requires addressing potential disparities in resource allocation and strengthening the enforcement of existing protocols. Continuous monitoring, regular training, and periodic evaluation of mitigation strategies are essential to ensure they remain effective and responsive to emerging public health threats. By fostering a resilience and proactive preparedness culture, Bayelsa's healthcare sector can maintain a robust defence against future emergencies. it was also concluded that the most common hazards reported by health workers include high workloads, frustration due to resource inadequacies, and challenging work schedules, with less frequent hazards such as radiation exposure and extreme temperatures.

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