

Operational Efficiency of Emergency Units in Tertiary Hospitals: A Delay and Waiting Time Assessment in Ilorin, Nigeria

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Received: 11.04.2026 | Accepted: 01.05.2026 | Published: 02.05.2026

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DOI: [10.5281/zenodo.19977231](https://doi.org/10.5281/zenodo.19977231)

Abstract

Original Research Article

Introduction: Overcrowding in emergency departments and long waiting times adversely affect the quality of care and the well-being of patients. In Nigeria, patients seeking medical attention from the emergency departments in the country's tertiary hospitals are faced with challenges, but little is known about emergency departments delays in Ilorin, Nigeria.

Objectives: To determine delays and waiting time in emergency departments, their associated factors, and how these factors relate to patients' satisfaction levels in Ilorin, Nigeria.

Methods: The study design involves a descriptive, cross-sectional survey among 368 patients/relatives at Kwara State University Teaching Hospital, Ilorin, conducted between January and March 2026. A systematic random sampling method was employed in the recruitment process. Information regarding socio-demographic characteristics, waiting times, factors, and satisfaction levels was obtained through an interviewer-administered, pre-tested questionnaire with time-motion analysis. Data were analyzed using STATA version 17.0 software and associations were tested with Pearson's chi-square and multivariate logistic regression analysis.

Results: The prevalence of delays was two-thirds (66.3%). Time to physician was 106±117 minutes; while 32.61% waited for at least 121 minutes. The longest delay was obtaining diagnostic results (66.85%). Major causes of delays were large patient load (89.14%), communication problems (86.68%), poor triage (84.51%), and shortage of staff (82.34%). Satisfaction rates overall was 79.89%, and efficiency of resources was 90.22%. Female gender, Muslims, Yoruba, and primarily educated patients had better satisfaction levels ($p < 0.05$). Unexpectedly, longer waiting times were significantly associated with high patient satisfaction. Age between 33-46 years and above 75 years, along with males, significantly affected the lower satisfaction rate. The problem of quasi-complete separation made the estimation of some waiting times difficult.

Conclusion: Delays in Kwasuth emergency department are high because of system-related factors, but patients' satisfaction is surprisingly high due to low expectations and the influence of triage. Immediate improvement of triage, diagnostics through digitization, staffing, and communication can improve the situation and bring reality closer to expectations.

Keywords: Emergency department, Overcrowding, Patient satisfaction, Triage, Tertiary hospital, Waiting time, Nigeria.

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Citation: Issa, Y. F., Ige, E. T., Ogun, A. D., Agboola, A. O., Saka, S. B., Bilewu, O. O., & Oyeniyi, J. A. (2026). Operational efficiency of emergency units in tertiary hospitals: A delay and waiting time assessment in Ilorin, Nigeria. *Global Academic and Scientific Journal of Multidisciplinary Studies (GASJMS)*, 4(5), 1-28.

Introduction

Emergency departments (EDs) of tertiary hospitals form the first point of providing urgent and lifesaving services to patients suffering from acute injuries or severe health conditions. These units, which are open throughout the day, play a role in stabilizing and treating emergencies such as traumas, heart attacks, breathing difficulties, and many other cases (Lunevicius, 2024). Being the highest level of health services provided, tertiary hospitals have state-of-the-art diagnostic equipment and multi-professional teams composed of emergency physicians, nurses, and paramedics, all of whom quickly triage patients according to their medical urgency (Cimino & Braun, 2023; Patiño et al., 2022). While the primary mission of EDs is to offer fast and effective health services that will reduce fatalities, this objective faces challenges due to delays at different levels of health service provision.

Longer wait times and delayed emergency care continue to be an endemic issue with implications for patient experience and satisfaction (Savioli et al., 2022). Delay is due to the presence of various factors, with the key factor being ED overcrowding due to a higher number of patients than can be accommodated by the department (Darraj et al., 2023). Staff shortage, lack of beds, and other constraints related to diagnostics and admission procedures all contribute to delay, especially in under-resourced facilities (Soyemi & Aborode, 2022). Wait time, defined as the time elapsing between arriving at the hospital and consulting with the doctor, is determined by triage accuracy, administrative procedures, and the complexity of patient conditions (Alrajhi et al., 2020; Liao et al., 2022). Although technological advancements have helped decrease wait times in well-equipped departments in high-income countries, many EDs in poorer nations are yet to meet the recommended standard of seeing 90% of their patients within 30 minutes of arrival (Al-Harajin et al., 2019). The following examples from a variety of settings demonstrate this disparity: waiting times averaging 60 minutes in Atlanta, United States, and 188 minutes in Michigan (Biya et al., 2022), in contrast to 173 minutes in Benin and 73 minutes in University

College Hospital, Ibadan, Nigeria. Emerging research in Sub-Saharan Africa further underscores the growing issue of ED overcrowding and delays that have occurred since the onset of COVID-19 because of staff reductions and patient acuity (Savioli et al., 2022; Abubakar et al., 2024).

Globally, the long wait time in EDs is one of the most common reasons why patients file complaints because it leads to dissatisfaction, stress, and disrespectful treatment (Zhang et al., 2023; Fontova-Almató et al., 2019). The unpredictable nature of patients' presentations calls for quick decision-making, but overcrowding interferes with this process (Cassarino et al., 2019). In Nigeria, EDs in tertiary hospitals often operate with limited staff and equipment, causing prolonged waits that may exacerbate patients' conditions (Soyemi & Aborode, 2022). Regionally, studies conducted in West Africa indicate comparable results in which the average stay in EDs exceeds 4 hours because of triaging and delayed referral to specialists (Mensah et al., 2024). On a national level, the Nigerian healthcare system struggles to accommodate the increasing number of emergencies without expanding its facilities and staffing, and this problem will likely persist amid population growth and non-communicable diseases (Federal Ministry of Health, 2024). It is, therefore, important to address ED delay due to the fact that the length of emergency stay is one of the most critical performance indicators of the quality of care provided in emergency settings (Shisundi et al., 2023). In addition to worsening the quality of care received by patients, long delays in treatment in EDs are associated with higher risks of adverse medical outcomes and increased morbidity and mortality (Hemmati et al., 2018). Although the global problem of excessive ED delays has been acknowledged, little research exists on the situation in specific countries, including North-Central Nigeria. Ilorin, the capital city of Kwara State, North-Central Nigeria is home to several tertiary hospitals that serve a wide-ranging population in the area; however, there is no available information regarding the issue of delays in these facilities' emergency departments. It is essential to develop context-specific knowledge and use it to implement interventions to improve ED operations and increase their efficiency to correspond with

Nigeria's national health policy guidelines and the WHO Emergency Care System Framework.

Thus, the primary objective of this study is to determine delay and waiting time in ED units of tertiary hospitals in Ilorin, Kwara State, Nigeria. It was hypothesized that waiting time is not significantly correlated with sociodemographic attributes of patients seeking emergency care in tertiary institutions in Ilorin, Nigeria.

Review of Literature

Theoretical Framework

The theoretical basis for this research can be justified using the Queuing Theory, which was mathematically modeled by the French mathematician S.D. Poisson (1781-1840). It represents an analytical method for understanding congestion and delay problems in processes of arrival, waiting for servicing, and departure (Saastamoinen et al., 2023). Queuing is applicable to healthcare because emergency departments should be considered as queuing systems: people with varied medical needs come, form a line, receive medical assistance, and leave (Raicu et al., 2023). Queuing theory has four basic elements, namely arrival rate, service rate, queue discipline, and number of servers, which correspond to ED operations (Joseph, 2020). Patient arrivals in EDs have random patterns and are classified based on severity, whereas the time needed for patient service is variable depending on medical staff assessment, diagnostic results, and the type of treatment (Liao et al., 2022). Queue discipline in emergency services is determined by the triage category, prioritizing certain patients for service (Qandeel et al., 2023). In contemporary EDs, processes involve multi-server systems wherein doctors, nurses, and laboratories work at once. The application of queuing models in cases when EDs have several servers allows estimating the number of people that should be allocated to minimize delays (Rehman et al., 2023).

Empirical Framework

Numerous empirical studies carried out in low-income, middle-income, and high-income countries

have revealed that there is always an extended period of time in waiting for services in emergency departments (EDs). Patient-related research conducted in Saudi Arabia revealed that although only 11% of ED patients had knowledge about triage, 51% of them knew how to prioritize patients, and 75% of them expected regular updates regarding their waiting times (Alhabdan et al., 2019). Empirical research done in India in a tertiary ED revealed a mean waiting time of 2.46 ± 1.26 hours, which was caused by consultations, investigations, lack of transport facilities, and admission processes (Sreekala et al., 2018). A study conducted in Bangladesh revealed mean waiting times of 8.06, 5.46, and 8 minutes for tickets, consultations, and nurses' attendance, respectively (Islam et al., 2020).

Another study on ED length of stay (LOS) in Saudi Arabia showed that 73.5% of patients had LOS <4 hours and the strongest predictor of total LOS was disposition decision time (Nhdi et al., 2021). Process mapping in Pakistan found that the median entry-to-disposition time was 50 minutes, while diagnostic testing increased the median waiting time to 41 minutes (Haroon et al., 2020). In Kenya, there was a significant correlation between the availability of health care workers and delayed communication and waiting time ($r = .281$ and $r = .228$; $p < 0.01$). Therefore, the two factors could be modifiable determinants of the problem (Shisundi et al., 2023). The findings in India demonstrated that 18.14% of patients waited for more than 2 hours due to a lack of drugs and equipment, although patient satisfaction remained at 98%. The importance of system-level factors cannot be understated. In Nigeria, the rate of patient satisfaction with emergency services was 90.5%, yet 51.8% indicated the need for additional staffing, while 41.2% required more equipment (Olamide et al., 2021). It follows from all these studies that the factor of waiting time remains critical and is defined by various variables such as staffing, diagnostics, triaging, communication, and infrastructural issues.

Conceptual Framework

Hospital emergency unit delay and waiting times can best be explained through an analysis of the interaction between patient-based, process-based,

and hospital-based variables (Ataman et al., 2023). The patient-based factors include socio-demographic variables, such as age, gender, place of residence, and employment status. Other factors include the referral source, illness severity, diagnosis, and the facility that the patient has previously visited. The above will influence the nature of the treatment, its complexity, and hence the degree of tolerance for delays and waiting periods (Phukubye et al., 2023). Process-based factors refer to efficiency within the process; these include triage processes, communication systems, staffing levels, mobility, patient arrival times, service point, workload, equipment availability, and queue management. Hospital-based factors include aspects such as

design, space sufficiency, distance between units, sharing of facilities, amenities, technology, and following standards. As per the conceptual model, it is believed that the three variables come together to affect patient waiting time, the dependent variable under study (Figure 1). High waiting time results in poor clinical outcomes, low patient satisfaction, and poor quality perception (Muraleedharan & Chandak, 2022). Importantly, the theory of queues becomes the connecting link through which all these factors impact waiting time; factors like patient and hospital factors have an impact on arrival and service rates, whereas process factors affect queue discipline and server arrangement.

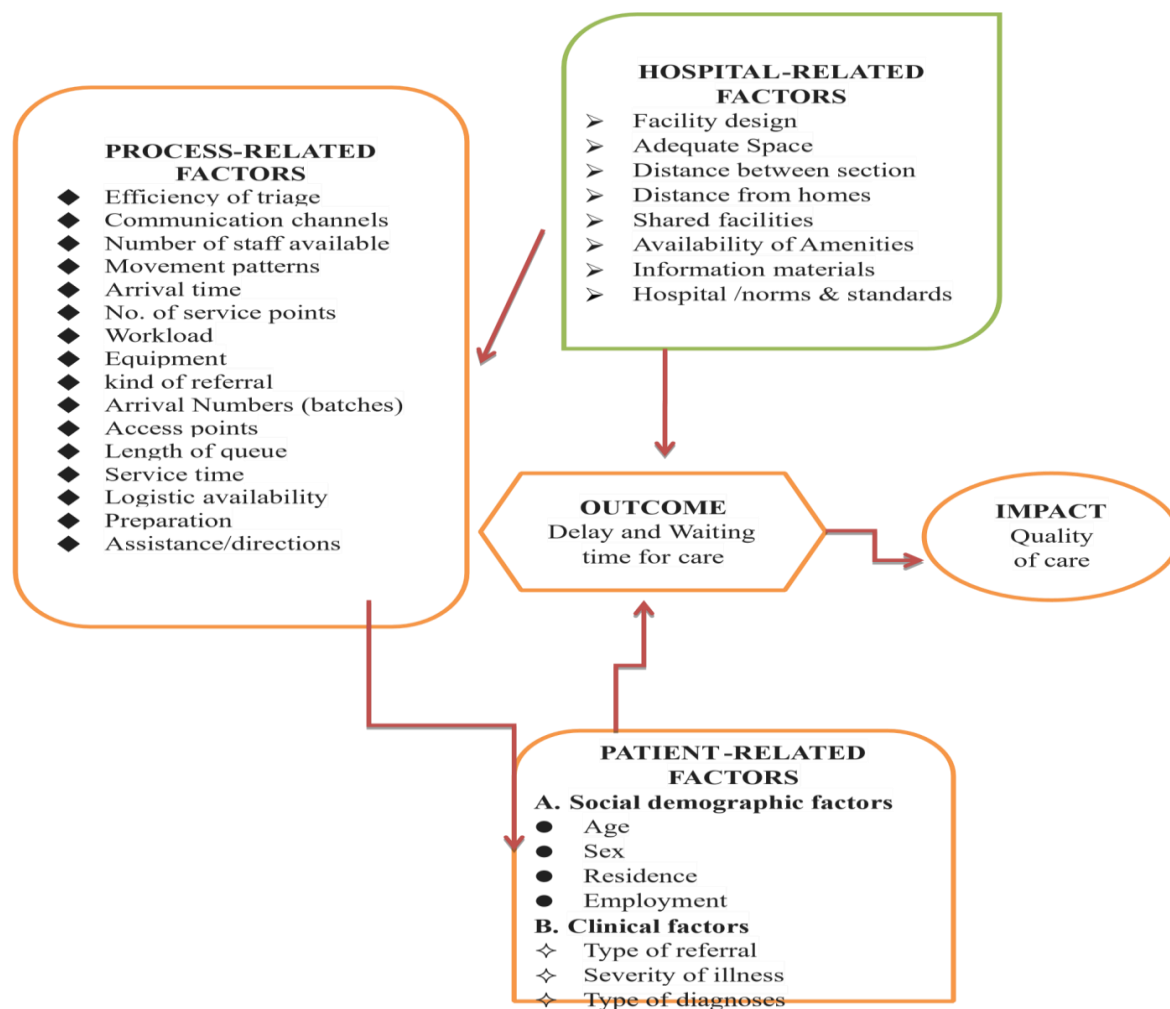


Figure 1: Conceptual Framework showing relationship between patient-based, process-based, and hospital-based variables

Materials and Methods

Study Area

This study was carried out in Ilorin, which is the capital city of Kwara State, situated in North-central Nigeria. Kwara State borders Niger State to the north, Kogi State to the east, Osun, Oyo, and Ekiti states to the south, while the Republic of Benin forms its western border. Ilorin is approximately 302km away from Lagos and 475km away from Abuja. With reference to the 2006 National Population Census of Nigeria, with an estimated annual growth rate of 3.2%, the estimated population of Kwara State in 2023 is 4,048,584 people. The male-to-female sex ratio in Kwara State is 1:1.15. There are 16 Local Government Areas in Kwara State. The predominant ethnic group in Kwara State is the Yoruba race, followed by Hausa and Fulani races, amongst others. Farming, civil service, trading, and skilled crafts form the major occupations in Kwara State. The tertiary health institutions in Ilorin include the University of Ilorin Teaching Hospital, Oke-oyi, Ilorin, Kwara State University Teaching Hospital, Surulere, Ilorin, Sobi Specialist Hospital, Alagbado, Ilorin and the Children Specialist Hospital, Centre Igboro, Ilorin. These health facilities are involved in health promotion, preventive, curative and rehabilitative services. Of these hospitals, the Kwara State University Teaching Hospital, Surulere, Ilorin (KWASUTH) was purposively selected as the site for this study due to its unique location, where it is easily accessible from any part of the city, and for been capable of receiving referrals and providing round-the-clock emergency and inpatient services for Kwara and other neighboring states.

KWASUTH, which was previously known as General Hospital Ilorin, is a state-owned, 350-bed capacity teaching hospital. The hospital is located at Surulere suburb at the centre of the city from where it operates, having been upgraded to a teaching hospital in 2024 upon affiliation with Kwara State University. The hospital renders general health care services to the community and its Emergency Department runs on a 24-hour schedule and takes about 20-30 cases on a daily basis. There are three types of emergencies within the hospital; they are

Adult Emergency, Pediatric Emergency, and Obstetric Emergency. Having been accredited as a teaching hospital affiliated with the College of Health Sciences at Kwara State University, it provides clinical training and research facilities, and was granted in March 2026, the status of being a preclinical training site by the Medical and Dental Council of Nigeria (MDCN).

Study Design

A descriptive cross-sectional survey with quantitative methodology was carried out from January to March 2026 within the emergency departments of KWASUTH in Ilorin to investigate delay and waiting time among patients in the emergency units.

Study Population

The population included in the study was adults aged 18 years and above attending EDs in WASUTH during the study period, and their one accompanying adult relative. Adult patients aged 18 years and above attending the ED, giving informed consent; one adult relative aged 18 years and above per patient, present at the time of data collection and giving informed consent; were considered eligible to participate in the study. Conversely, adults who were either unconscious or critically ill, severely debilitated and could not answer questions, without any proxy; patients or relatives who have a mental disorder or cognitive impairment that affects their ability to give consent or provide an adequate response, and patients declining to participate in the study were ineligible for inclusion in the study.

Sample Size Determination

The minimum sample size for this study was calculated using the Cochran formula for cross-sectional studies:

$$n = Z^2pq / d^2$$

Where:

Z = 1.96 for 95% confidence level

$p = 0.50$ (assumed 50% prevalence of prolonged waiting time, as no local data existed)

$q = 1 - p = 0.50$

$d = 0.05$ (5% margin of error)

Substituting,

$n = (1.96)^2(0.50)(1-0.50) / (0.05)^2 = 384$

To adjust for 20% non-response, the final sample size was:

$nf = \{384\} / \{0.8\} = 480$

Thus, a minimum of 480 patient-relative pairs were targeted. However, only 368 patients or their relative consented to participate in this study and had the questionnaire administered to them, giving a response rate of 77 percent.

Sampling Technique

A systematic random sampling method was employed for selecting the patients. An average of 65 patients was seen on a typical day at the hospital EDs during the previous 3 months, which serve as the sampling frame. The sample interval at k^{th} was determined as follows: $N/n = 65/8 = 8$, in which 8 patients were enrolled daily from the hospital. The first patient on any given day was randomly chosen from the first 8 patients that appeared on the scene. Afterward, every eighth patient (k^{th}) was included until the daily requirement was met. Family members of the selected patients were included automatically.

Instrument and Method of Data Collection

Data were collected using a pretested, structured, interviewer-administered questionnaire developed from a literature review and queuing theory constructs. The questionnaire had 5 sections:

Section 1: Socio-demographic Information

Section 2: Assessment of Delay and Waiting Time

Section 3: Factors Contributing to Delays and Waiting Time

Section 3: Implications of Delays and Waiting Time

Section 5: Patients' Perception

Waiting times were collected using a time-motion technique, whereby a research assistant trained on time-motion recording collected time intervals from the point of arrival of the patients in the ED to their discharge. Staff perceptions were collected using a semi-structured questionnaire.

Questionnaire development was done in the English language, after which translations into Yoruba were done. Back translations to English were done for accuracy in semantic equivalence. The face validity of the questionnaire was checked by experts who were two emergency physicians, one public health specialist, and one statistician. The average time for questionnaire completion was 15 minutes, and Cronbach's Alpha was 0.82.

Ten research assistants, composed of 4 medical record officers and 6 final year nursing students, were trained for two days on ethics, time motion study, and completion of questionnaires. The data were collected for 12 hours daily (from 8 am – 8 pm) for 12 weeks to cover all shift patterns. The time was taken when patients arrived, and their consent was taken.

Prospective time points were collected by synchronizing the digital clock. Follow-ups were done till their disposition (admission, discharge, or referral).

The technique of time-motion study was used to gather objective data on patient waiting times and service times in the ED. Research assistants underwent training to conduct direct observations of the patients, who were randomly selected, from the time they came in until the time they were discharged or admitted. The use of data collection sheets, which have specific time points, allowed the recorders to note down precisely the time of arrival, registration, completion of triage, initial doctor encounter, orders for tests, receipt of test results, administration of medications, and finally, discharge or admission. Prior to data collection, all stopwatches were synchronized. The time for each step was computed by subtracting the starting time from the ending time.

Measurement of Variables

The dependent variable is the total emergency department (ED) waiting time, which measures the

duration between patient arrival and physician evaluation. Prolonged waiting time is considered to be greater than 30 minutes, following WHO guidelines for emergency care. The independent variables include socio-demographic factors (age, gender, educational qualification, and occupational status), clinical factors (triage classification, diagnosis), process-related factors (time of arrival, shift, ordered tests, and staff availability), and hospital factors (facility location and bed availability). The perceived barriers among staff members were rated on a five-point Likert scale.

Data Management and Analysis

Data entry, cleaning, and analyses were done using STATA version 17.0. Descriptive statistics were calculated for all variables. Categorical variables such as socio-demographics, nature of emergency, and delay category were presented with frequencies and percentages. Means and standard deviations were calculated for continuous variables like age and waiting times for each emergency procedure. Chi-squared test was done to find out the association between categorical variables and patients' satisfaction level. The variables whose p-value was less than 0.05 from bivariate analysis were included in multivariable logistic regression to find out the predictors of good patient satisfaction. In order to find out the relationship between the waiting time intervals and patients' satisfaction, a multivariable logistic regression analysis was done with 'good satisfaction' as the dependent variable. Odds ratio (OR) and confidence interval (CI) were reported. The presence of quasi-complete separation and/or complete separation was considered when there were no observations on particular cells of a table. Time motion analysis data were analyzed by calculating the mean and standard deviations. All the analyses were two-tailed, and the significance level was considered to be $p < 0.05$.

Consent and Methods of Protection of Human Subjects

Informed consent was obtained from all the patients or their relative before engaging them in the study. This included providing information on the aim,

objectives, process, benefits, and even risks involved in the research in the form of an information sheet that was distributed to all the eligible participants. Participants were given the chance to ask questions about things that they were not sure of. Those who agreed to participate in the study also signed a consent form indicating that they were aware of their rights, including withdrawing from the study. The consent forms were separated from the anonymous questionnaire and put in a cabinet that is secured with a lock and can only be accessed through the computer that is password-protected by the principal investigator. Confidentiality was observed during data collection and processing, as well as in all processes of conducting this study.

Ethical Issues

Ethical approval was obtained from the Kwara State Ministry of Health Ethical Review Committee. Clearance and permission were sought from the officer-in-charge of the Accident and Emergency Units and the Hospital Ethical Review Board. Written informed consent was obtained from participants or their family members/relative. Participation was completely voluntary, and there was no consequence for declining to participate or withdrawing at any point during the process. Moreover, they were fully informed that they can withdraw from the study at any time and face no consequences whatsoever as far as the withdrawal is concerned. There were absolutely no risks associated with taking part in the study, and the benefits of the study were worth much more than the risks involved. The present study complies with the requirements of the Helsinki Declaration. Information about all the respondents were kept strictly confidential and anonymous throughout the study process.

Results

Demographic and Socio-economic characteristics of respondents

Table 1 showed that more than half of the patients (54.89%) visiting the emergency unit are female, with most of the patients (79.62%) residing in urban areas. Educationally, 30.43% had no formal education and 30.16% had secondary education,

together accounting for 60.59% of respondents. In terms of occupation, traders comprised the largest group (42.39%). The nature of emergencies is predominantly medical (76.9%), followed by

surgical cases (9.51%), with most of the patients experiencing moderate severity (52.72%) in their emergencies.

Table 1: Demographic and Socio-economic characteristics of respondents

Variable	Frequency (n=368)	Percent (100%)
Age in years		
18-32	94	25.54
33-46	101	27.45
47-60	96	26.09
61-74	60	16.3
≥75	17	4.62
Mean age ± SD	46 ± 17	
Gender		
Female	202	54.89
Male	166	45.11
Residence		
Rural	75	20.38
Urban	293	79.62
Educational status		
No formal education	112	30.43
Primary	63	17.12
Secondary	111	30.16
Tertiary	82	22.29
Occupation		
Civil servant	57	15.49
Artisan	24	6.52
Trader	156	42.39
Farmer	63	17.12
Student	68	18.48
Religion		
Christianity	91	24.73
Islamic	277	75.27
Ethnicity		
Hausa/Fulani	24	6.52
Igbo	24	6.52
Yoruba	320	86.96
Marital Status		
Single	80	21.74
Married	230	62.5
Divorced/Separated	27	7.34
Widowed	31	8.42
Are you on any form of health insurance?		
No	323	87.77
Yes	45	12.23
Average income		
<20,000	55	14.95

20,000-50,000	180	48.90
50,001-100,000	90	24.46
100,001-200,000	34	9.24
≥200,001	9	2.45
Average monthly income ± SD	71107 ± 107406	
Nature of emergency		
Medical	283	76.91
Obstetrics and gynaecology	8	2.17
Pediatrics	31	8.42
Psychiatry	3	0.82
Surgical	35	9.51
Others	8	2.17
level of severity		
Mild	84	22.83
Moderate	194	52.71
Severe	90	24.46
Status		
Health worker	2	0.54
Patient	204	55.44
Relative/caregiver	160	43.48
Others	2	0.54

Average delay and waiting time for patients in the emergency units

As shown in Table 2, about two-thirds (66.3%) of patients experienced delays in the emergency unit. The most common delay is waiting to be attended to by a doctor, with about a third (32.61%) waiting 121 minutes or more. Similarly, 61.68% experienced delays in getting a doctor, and more than half (54.62%) faced delays in receiving medications.

Registration and initial assessment times also show considerable delays, and 30.98% took within 30 minutes for registration. Same for initial assessment: 33.7% within 30 minutes. Investigations are another major area of delay, as two third of respondents (66.85%) reported delays in receiving diagnostic results, and the highest percentage of delays (66.85%) was in receiving diagnostic results. Figure 2 is a Boxplot of waiting times for different emergency unit processes in this study area.

Table 2: Assessment of delay and waiting time

Variable	Frequency (n =368)	Percent (100%)
Do you or your relative experience any form of delay in emergency unit?		
No	124	33.7
Yes	244	66.3
How long (in minutes) after arrival did it take you /your patient to be attended to by a doctor		
0-5	11	2.99
Within 10 minutes	34	9.24
Within 30 minutes	90	24.46
Within 60 minutes	43	11.68

Within 120 minutes	70	19.02
≥121 minutes	120	32.61
Average waiting time in minutes ± SD	106 ± 117	
How long (in minutes) after arrival did it take you/your patient to register with the hospital (open medical record file)		
0-5	34	9.24
Within 10 minutes	57	15.49
Within 30 minutes	114	30.98
Within 60 minutes	80	21.74
Within 120 minutes	62	16.85
≥121 minutes	21	5.70
Average waiting time in minutes ± SD	39 ± 38	
How long (in minutes) after arrival did it take you /your patient to get any form of medication		
0-5	26	7.07
Within 10 minutes	39	10.6
Within 30 minutes	109	29.62
Within 60 minutes	59	16.03
Within 120 minutes	72	19.57
≥121 minutes	63	17.11
Average waiting time in minutes ± SD	64 ± 71	
How long after arrival did it take you /your patient to get any investigation done		
0-5	39	10.6
Within 10 minutes	39	10.6
Within 30 minutes	108	29.35
Within 60 minutes	79	21.47
Within 120 minutes	25	6.79
≥121 minutes	78	21.19
Average waiting time in minutes ± SD	66 ± 79	
Did you/your patient experience any form of delay in getting a doctor to attend to you at emergency unit?		
No	141	38.32
Yes	227	61.68
Did you/your patient experience any form of delay in getting medication at emergency unit?		
No	167	45.38
Yes	201	54.62
Did you/your patient experience any form of delay in getting investigation done at emergency unit?		
No	160	43.48
Yes	208	56.52
Was there any delay in the registration process?		
No	198	53.8
Yes	170	46.2
Time taken for initial assessment		
0-5	31	8.42
Within 10 minutes	47	12.77

Within 30 minutes	124	33.7
Within 60 minutes	70	19.02
Within 120 minutes	56	15.22
≥121 minutes	40	10.87
Average waiting time in minutes ± SD	45 ± 45	
Did you experience any delays during the initial assessment?		
No	201	54.62
Yes	167	45.38
Time taken for diagnostic procedures (e.g. X-rays lab tests)		
0-5	22	5.98
Within 10 minutes	26	7.07
Within 30 minutes	97	26.36
Within 60 minutes	45	12.23
Within 120 minutes	78	21.2
≥121 minutes	100	27.16
Average waiting time in minutes ± SD	82 ± 86	
Were there any delays in receiving diagnostic results?		
No	122	33.15
Yes	246	66.85
Time taken for consultation with specialists		
0-5	47	12.77
Within 10 minutes	34	9.24
Within 30 minutes	133	36.14
Within 60 minutes	80	21.74
Within 120 minutes	38	10.33
≥121 minutes	36	9.78
Average waiting time in minutes ± SD	49 ± 66	
were there any delays in consulting with specialists?		
No	213	57.88
Yes	155	42.12
Time taken to receive prescribed medications?		
0-5	45	12.23
Within 10 minutes	43	11.68
Within 30 minutes	105	28.53
Within 60 minutes	74	20.11
Within 120 minutes	50	13.59
≥121 minutes	51	13.86
Average waiting time in minutes ± SD	55 ± 65	
Did you experience any delays in receiving medications?		
No	179	48.64
Yes	189	51.36
Which area did you experience most delay at the emergency unit		
Investigation	91	24.73
Medication	61	16.58
Others	76	20.65
Seeing doctor	125	33.96
Emergency surgery	15	4.08

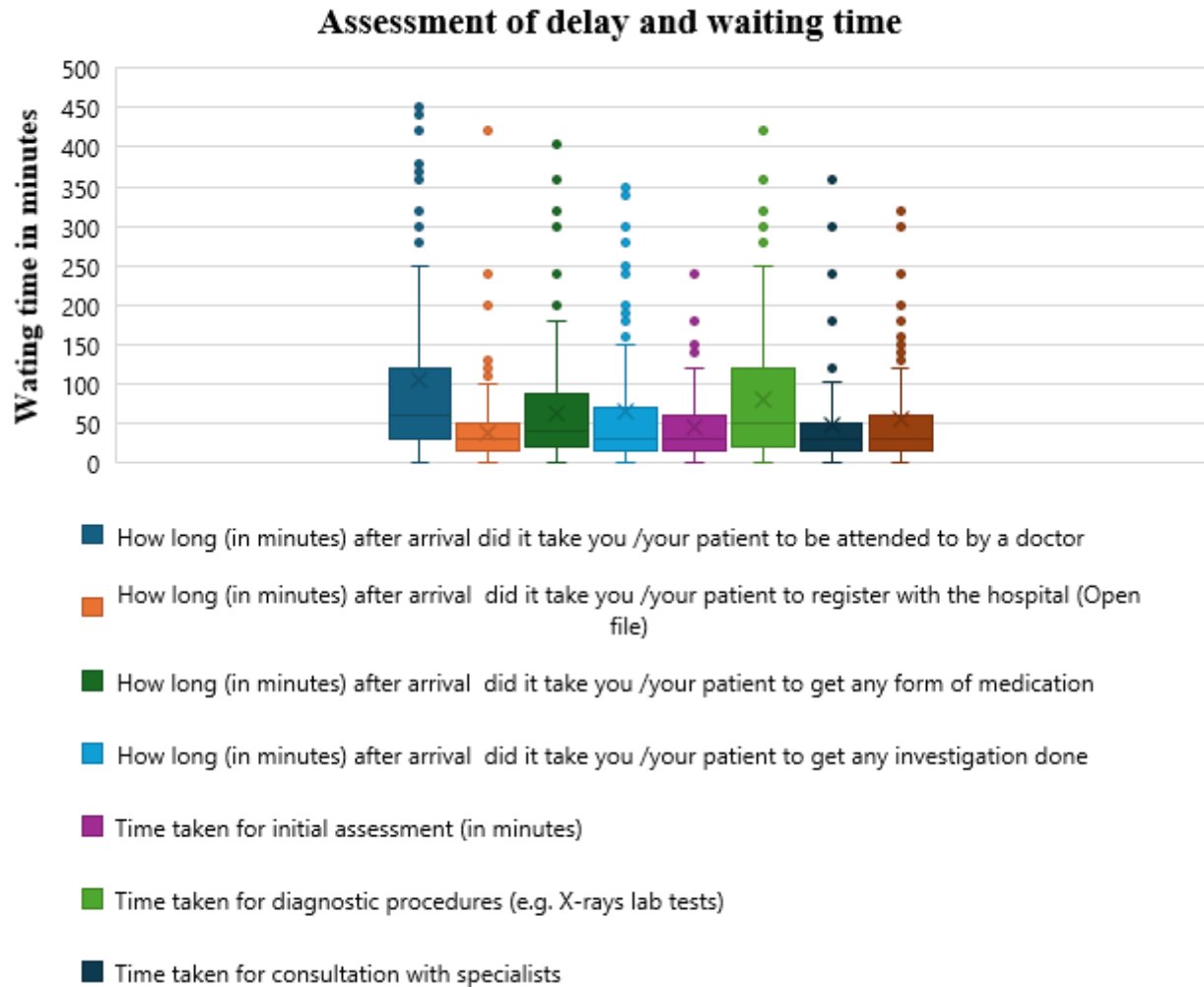


Figure 2: Boxplot of Waiting Times for Different Emergency Unit Processes

Factors contributing to delays and increased waiting time in emergency care.

Table 3 revealed that 88.32% agreed and 0.82% strongly agreed that high patient volume and communication breakdowns (86.41%) were viewed as the most significant factors contributing to delays in emergency care by respondents in this study. Respondents also identified inadequate triage systems and lack of essential medical equipment as

major issues, with more than three quarter (84.24%) agreeing on both points. Staff shortage and administrative processes were recognized as substantial contributors to delays by more than three quarter (82.07% and 81.52%) of respondents, respectively. Conversely, there is broad support for efficient coordination and streamlined procedures as potential solutions, with more than three fourth (84.78% and 84.24%) agreeing that these could improve care timeliness.

Table 3: Perceived factors contributing to delay and waiting time

Factors	SA(%)	A(%)	N(%)	D(%)	SD(%)
Administrative processes contributed to delays in the emergency unit.	3(0.82)	300(81.52)	6(1.63)	59(16.03)	
Staff shortage was a significant factor in increased waiting time	1(0.27)	302(82.07)	3(0.82)	62(16.85)	
Inadequate triage systems contributed to delays in patient care	1(0.27)	310(84.24)	4(1.09)	53(14.4)	
Lack of essential medical equipment prolonged waiting time	1(0.27)	310(84.24)	6(1.63)	51(13.86)	
Communication breakdowns among healthcare staff led to delays	1(0.27)	318(86.41)	6(1.63)	43(11.68)	
High patient volume was a key factor in extended waiting time	3(0.82)	325(88.32)	9(2.45)	29(7.88)	2(0.54)
The Hospital's admission process contributed to delays in the emergency unit	2(0.54)	315(85.6)	7(1.9)	44(11.96)	
Efficient coordination among hospital departments could reduce waiting times	1(0.27)	312(84.78)	9(2.45)	46(12.5)	
Streamlined administrative procedures could improve the timeliness of emergency care.	2(0.54)	310(84.24)	8(2.17)	48(13.04)	
Adequate staffing levels are essential to minimize delays in the emergency unit	4(1.09)	317(86.14)	5(1.36)	42(11.41)	

SA = Strongly agree, **A** = Agree, **N** = Neutral, **D** = Disagree, **SD** = Strongly disagree

Delays in emergency care significantly affect patient satisfaction and treatment effectiveness, with more than three quarter (87.23% and 89.4%) of respondents agreeing on these negative impacts. The majority (88.04%) believe that reducing waiting times and ensuring timely care (86.14%) are crucial for improving care quality and patient outcomes. They also support providing information about

waiting times and prioritizing patient safety (85.6% and 84.78%, respectively). Overall, more than three quarter (79.89%) report good satisfaction with the hospital, showing that effective delay management positively affects perceptions of care quality and commitment to patient well-being as shown in Table 4:

Table 4: Implications of delays and waiting time on patient outcomes and satisfaction

Variable	SA(%)	A(%)	N(%)	D(%)	SD(%)
Delays in emergency care negatively affected my overall satisfaction with the hospital	7(1.9)	321(87.23)	5(1.36)	33(8.97)	2(0.54)
Extended waiting time compromise the effectiveness of my treatment	7(1.9)	329(89.4)	5(1.36)	26(7.07)	1(0.27)
I believe that delays in emergency care have consequences on patient outcomes	6(1.63)	319(86.68)	10(2.72)	32(8.7)	1(0.27)

Improved waiting time would enhance the overall quality of emergency care	6(1.63)	319(86.68)	8(2.17)	34(9.24)	1(0.27)
The hospital should prioritize reducing waiting times to improve patient satisfaction	8(2.17)	324(88.04)	3(0.82)	32(8.7)	1(0.27)
The hospital's efforts to minimize delays positively influenced my perception of the quality of care	8(2.17)	318(86.41)	8(2.17)	33(8.97)	1(0.27)
Timely care in the emergency unit contributes to better patient outcomes	6(1.63)	317(86.14)	7(1.9)	37(10.05)	1(0.27)
Adequate information about expected waiting times can mitigate the negative impact of delays	6(1.63)	315(85.6)	4(1.09)	42(11.41)	1(0.27)
The Hospital should implement measure to prioritize patient safety during periods of increased waiting time	6(1.63)	312(84.78)	5(1.36)	44(11.96)	1(0.27)
Overall, the hospital's handling of delay influenced my perception of its commitment to patient well-being.	7(1.9)	304(82.61)	8(2.17)	48(13.04)	1(0.27)
Level of satisfaction					
Good	294(79.89)				
Poor	74(20.11)				

SA = Strongly agree, A = Agree, N = Neutral, D = Disagree, SD = Strongly disagree

Perception of patients regarding the efficiency of and resource availability in the emergency unit

As depicted in Table 5, most (90.22%) rated resource allocation as efficient/very efficient, with 77.99% rating it efficient and 12.23% very efficient.

However, a small percentage find it inefficient (8.97%) or very inefficient (0.82%). Regarding resource availability, three quarter (75%) consider it adequate, while less than a one fifth (18.21%) view it as insufficient.

Table 5: Patient perception about care efficiency and resource availability in emergency unit

As an emergency patient, please rate the efficiency of resource allocation in the emergency unit	Frequency (n = 368)	Percent (100%)
Efficient	287	77.99
Inefficient	33	8.97
Very efficient	45	12.23
Very inefficient	3	0.81
How would you rate the overall resource availability in the emergency unit?		
Abundant	25	6.79
Adequate	276	75
Insufficient	67	18.21

Association between sociodemographic parameters of participants and level of satisfaction

According to Table 6, several socio-demographic variables had a significant correlation with patients' satisfaction levels in the emergency unit. The first variable that correlated significantly with satisfaction was gender, where $\chi^2 = 5.08$ and $p = 0.024$. Females expressed high satisfaction levels compared to men (84.16% and 74.70%, respectively). The next socio-demographic variable that correlated significantly with satisfaction was educational status ($\chi^2 = 20.25$, $p < 0.001$). Individuals who completed primary

education exhibited the highest level of satisfaction (95.24%), while individuals who completed secondary education had the least levels of satisfaction (67.57%). Another socio-demographic variable that correlated significantly with patients' satisfaction was religion ($\chi^2 = 10.41$, $p = 0.001$). Muslims expressed higher levels of satisfaction (83.75%) than Christians (68.13%). Other socio-demographic factors that had a significant impact on patients' satisfaction were ethnicity ($\chi^2 = 14.20$, $p = 0.001$). The Yoruba people were the most satisfied group (82.81%), followed by Hausa/Fulani and Igbo.

Table 6: Association between sociodemographic parameters of participants and level of satisfaction.

Variable	Level of satisfaction			χ^2	p value
	Good n(%)	Poor n(%)	Total (100%)		
Age in years					
18-32	80(27.21)	14(18.92)	94(25.54)	8.7576	0.067
33-46	80(27.21)	21(28.38)	101(27.45)		
47-60	77(26.19)	19(25.68)	96(26.09)		
61-74	41(13.95)	19(25.68)	60(16.3)		
≥ 75	16(5.44)	1(1.35)	17(4.62)		
Gender					
Female	170(57.82)	32(43.24)	202(54.89)	5.0755	0.024*
Male	124(42.18)	42(56.76)	166(45.11)		
Residence					
Rural	56(19.05)	19(25.68)	75(20.38)	1.6006	0.206
Urban	238(80.95)	55(74.32)	293(79.62)		
Educational status					
No formal education	92(31.29)	20(27.03)	112(30.43)	20.2515	<0.001*
Primary	60(20.41)	3(4.05)	63(17.12)		
Secondary	75(25.51)	36(48.65)	111(30.16)		
Tertiary	67(22.79)	15(20.27)	82(22.28)		
Occupation					
Civil servant	41(13.95)	16(21.62)	57(15.49)	9.0597	0.060
Artisan	23(7.82)	1(1.35)	24(6.52)		
Trader	130(44.22)	26(35.14)	156(42.39)		
Farmer	46(15.65)	17(22.97)	63(17.12)		
Student	54(18.37)	14(18.92)	68(18.48)		
Religion					

Christianity	62(21.09)	29(39.19)	91(24.73)	10.4064	0.001*
Islamic	232(78.91)	45(60.81)	277(75.27)		
Ethnicity					
Yoruba	265(90.14)	55(74.32)	320(86.96)		
Hausa/Fulani	16(5.44)	8(10.81)	24(6.52)	14.1986	0.001*
Igbo	13(4.42)	11(14.86)	24(6.52)		
Marital Status					
Single	63(21.43)	17(22.97)	80(21.74)		
Married	185(62.93)	45(60.81)	230(62.5)	0.2676	0.966
Divorced/Separated	22(7.48)	5(6.76)	27(7.34)		
Widowed	24(8.16)	7(9.46)	31(8.42)		
Are you on any form of health insurance?					
No	262(89.12)	61(82.43)	323(87.77)	2.4603	0.117
Yes	32(10.88)	13(17.57)	45(12.23)		
Average monthly income					
<20,000	46(15.65)	9(12.16)	55(14.95)		
20,000-50,000	147(50)	33(44.59)	180(48.91)		
50,001-100,000	65(22.11)	25(33.78)	90(24.46)	4.7711	0.312
100,001-200,000	29(9.86)	5(6.76)	34(9.24)		
≥200,001	7(2.38)	2(2.7)	9(2.45)		
Severity level					
Mild	69(23.47)	15(20.27)	84(22.83)		
Moderate	148(50.34)	46(62.16)	194(52.72)	3.6298	0.163
Severe	77(26.19)	13(17.57)	90(24.46)		

*Statistically significant

The findings presented in Table 7 reveal that there was a significant relationship between the period required for essential procedures during emergencies and patient satisfaction. However, the nature of relationships was contradictory, most probably due to the presence of confounders or small sample size. The period spent in waiting to see a doctor was significantly related to patient satisfaction ($\chi^2 = 45.24$, $p < 0.001$). Among patients who spent ≥ 121 minutes in waiting to see a doctor, 95.83% (115/120) were satisfied, while 57.14% (40/70) of those spending ≤ 120 minutes expressed their satisfaction. Also, there were significant relationships between satisfaction and the period required for registration

($\chi^2 = 24.60$, $p < 0.001$), obtaining drugs ($\chi^2 = 43.97$, $p < 0.001$), conducting investigations ($\chi^2 = 56.56$, $p < 0.001$), initial assessment ($\chi^2 = 75.44$, $p < 0.001$), diagnostic process ($\chi^2 = 35.16$, $p < 0.001$), consulting specialists ($\chi^2 = 72.96$, $p < 0.001$), and getting prescribed medications ($\chi^2 = 56.43$, $p < 0.001$) were all significantly associated with satisfaction, where a greater percentage of “good” satisfaction was recorded among those patients who had to wait for a long time. Such an inverse relationship could have been due to the fact that those patients whose condition was not that critical and waited for service because of other cases being attended to first were happy with.

Table 7: Association between waiting time and level of satisfaction of respondents

Variable	Level of satisfaction			χ^2	p value
	Good n(%)	Poor n(%)	Total (100%)		
How long after arrival did it take you/your patient to be attended to by a doctor					
0-5	9(3.06)	2(2.7)	11(2.99)	45.2416	<0.001*
Within 10 minutes	30(10.2)	4(5.41)	34(9.24)		
Within 30 minutes	69(23.47)	21(28.38)	90(24.46)		
Within 60 minutes	31(10.54)	12(16.22)	43(11.68)		
Within 120 minutes	40(13.61)	30(40.54)	70(19.02)		
≥121 minutes	115(39.12)	5(6.76)	120(32.61)		
How long after arrival did it take you /your patient to register with the hospital (Open file)					
0-5	31(10.54)	3(4.05)	34(9.24)	24.6033	<0.001*
Within 10 minutes	48(16.33)	9(12.16)	57(15.49)		
Within 30 minutes	98(33.33)	16(21.62)	114(30.98)		
Within 60 minutes	54(18.37)	26(35.14)	80(21.74)		
Within 120 minutes	42(14.29)	20(27.03)	62(16.85)		
≥121 minutes	21(7.14)	0(0)	21(5.71)		
How long after arrival did it take you /your patient to get any form of medication					
	Good	Poor	Total	43.9749	<0.001*
0-5	26(8.84)	0(0)	26(7.07)		
Within 10 minutes	37(12.59)	2(2.7)	39(10.6)		
Within 30 minutes	80(27.21)	29(39.19)	109(29.62)		
Within 60 minutes	39(13.27)	20(27.03)	59(16.03)		
Within 120 minutes	49(16.67)	23(31.08)	72(19.57)		
≥121 minutes	63(21.43)	0(0)	63(17.12)		
How long after arrival did it take you /your patient to get any investigation done					
0-5	38(12.93)	1(1.35)	39(10.6)	56.555	<0.001*
Within 10 minutes	33(11.22)	6(8.11)	39(10.6)		
Within 30 minutes	94(31.97)	14(18.92)	108(29.35)		
Within 60 minutes	51(17.35)	28(37.84)	79(21.47)		
Within 120 minutes	9(3.06)	16(21.62)	25(6.79)		
≥121 minutes	69(23.47)	9(12.16)	78(21.2)		
Time taken for initial assessment					
0-5	30(10.2)	1(1.35)	31(8.42)	75.4361	<0.001*
Within 10 minutes	44(14.97)	3(4.05)	47(12.77)		
Within 30 minutes	112(38.1)	12(16.22)	124(33.7)		
Within 60 minutes	46(15.65)	24(32.43)	70(19.02)		
Within 120 minutes	25(8.5)	31(41.89)	56(15.22)		
≥121 minutes	37(12.59)	3(4.05)	40(10.87)		

Time taken for diagnostic procedures (e.g. X-rays lab tests)					
0-5	20(6.8)	2(2.7)	22(5.98)		
Within 10 minutes	26(8.84)	0(0)	26(7.07)		
Within 30 minutes	87(29.59)	10(13.51)	97(26.36)		
Within 60 minutes	32(10.88)	13(17.57)	45(12.23)		
Within 120 minutes	47(15.99)	31(41.89)	78(21.2)	35.1593	<0.001*
≥121 minutes	82(27.89)	18(24.32)	100(27.17)		
Time taken for consultation with specialists					
0-5	46(15.65)	1(1.35)	47(12.77)		
Within 10 minutes	34(11.56)	0(0)	34(9.24)		
Within 30 minutes	114(38.78)	19(25.68)	133(36.14)		
Within 60 minutes	45(15.31)	35(47.3)	80(21.74)		
Within 120 minutes	20(6.8)	18(24.32)	38(10.33)	72.9639	<0.001*
≥121 minutes	35(11.9)	1(1.35)	36(9.78)		
Time taken to receive prescribed medications?					
0-5	44(14.97)	1(1.35)	45(12.23)		
Within 10 minutes	36(12.24)	7(9.46)	43(11.68)	56.426	<0.001*
Within 30 minutes	85(28.91)	20(27.03)	105(28.53)		
Within 60 minutes	39(13.27)	35(47.3)	74(20.11)		
Within 120 minutes	39(13.27)	11(14.86)	50(13.59)		
≥121 minutes	51(17.35)	0(0)	51(13.86)		

*Statistically significant

As shown in Table 8, even after adjusting for other confounding factors, both age and gender retained their independent association with patient satisfaction (Table 8). When compared to the age group 18-32, the age groups 33-46 (AOR=0.05, 95% CI: 0.004-0.68, p=0.025) and ≥75 years (AOR=0.05, 95% CI: 0.003-0.92, p=0.044) had 95% lower chances of being satisfied. The male gender (AOR=0.16, 95% CI: 0.04-0.75, p=0.020) was found to have 84% fewer odds of being satisfied compared

to female gender. Other variables including place of residence, educational attainment, employment, religious denomination, tribe, marital status, health insurance, mean monthly income, type of emergency, and severity level showed no significant association with patient satisfaction (p>0.05). Some of the estimates were statistically unstable due to very low cell numbers, especially in the categories 'occupation=Artisan' and age category '61-74', and these were dropped from the analysis.

Table 8: Logistic Regression Analysis of Association between socio-demographic parameters and level of satisfaction of respondents.

Variable	Level of Satisfaction		
	Odds Ratio	[95% Conf. Interval]	P>z
Age in years			
18-32	Reference		
33-46	0.050384	0.003714 - 0.683502	0.025
47-60	0.92256	0.054412 - 15.64221	0.955
61-74	(empty)		
≥75	0.049861	0.002705 - 0.919249	0.044
Gender			
Female	Reference		
Male	0.1637	0.035726 - 0.750086	0.02
Residence			
Rural	Reference		
Urban	0.216626	0.02106 - 2.228288	0.198
Educational status			
No formal education	Reference		
Primary	3.211877	0.110189 - 93.6222	0.498
Secondary	0.442676	0.038108 - 5.142341	0.515
Tertiary	0.583504	0.026211 - 12.98984	0.734
Occupation			
Civil servant	Reference		
Artisan	990.595	0.524221 - 1871881	0.073
Trader	1.780793	0.238988 - 13.2694	0.573
Farmer	0.733429	0.049232 - 10.92627	0.822
Student	0.039111	0.000444 - 3.447355	0.156
Religion			
Christianity	Reference		
Islam	3.837482	0.540172 - 27.26218	0.179
Ethnicity			
Yoruba	Reference		
Hausa/Fulani	3.182839	0.225727 - 44.87923	0.391
Igbo	4.530996	0.41142 - 49.90016	0.217
Marital Status			
Single	Reference		
Married	0.211415	0.002255 - 19.81904	0.502
Divorced/Separated	0.102318	0.000385 - 27.21556	0.424
Widowed	0.055015	0.000297 - 10.18667	0.276
Are you on any form of health insurance?			
No	Reference		
Yes	1.19916	0.142006 - 10.12626	0.867
Average monthly income			
<20,000	Reference		
20,000-50,000	0.284367	0.008723 - 9.270611	0.479
50,001-100,000	0.159145	0.002931 - 8.640566	0.367
100,001-200,000	2.705617	0.022254 - 328.9484	0.684

≥200,001	0.138194	0.000574 - 33.29613	0.479
Nature of emergency			
Medical	Reference		
Obstetrics and gynaecology	(empty)		
Pediatrics	(empty)		
Psychiatry	(empty)		
Surgical	4.672332	0.51978 - 41.99985	0.169
Others	0.169427	0.021282 - 1.348818	0.093
Severity level			
Mild	Reference		
Moderate	1.536787	0.245806 - 9.608023	0.646
Severe	1.473169	0.117072 - 18.53754	0.764

As depicted in Table 9, multivariable logistic regression revealed that certain waiting time intervals are significantly associated with satisfaction, although some of the estimated odds ratios were highly unstable due to sparseness of observations (Table 9). Waiting time equal or exceeding 121 minutes to see the doctor was significantly related to good satisfaction ($p = 0.001$). However, the odds ratio was huge (AOR = 407,591.8, 95% CI: 153.75-1.08×10⁹), which is a sign of quasi-complete separation. This value should be considered as indicative of very high positive association, but it cannot be viewed as an actual estimate of the association strength. Patients who

waited up to 10 minutes before starting any investigations showed significantly less chances of good satisfaction than those waiting only up to 5 minutes (AOR = 0.002, 95% CI: 0.000006-0.89, $p = 0.046$). Also, waiting until 120 minutes before conducting investigations lowered the odds of being satisfied significantly (AOR = 0.0006, 95% CI: 0.000001-0.52, $p = 0.032$). The other waiting time variables did not show any significant correlation with satisfaction owing to wide confidence intervals resulting from small sample sizes in subgroups. Some of the odds ratios were undefined due to zero cells in particular groups.

Table 9: Logistic Regression Analysis of Association between waiting time and level of satisfaction of respondents.

Variable	Level of Satisfaction		
	Odds Ratio	[95% Conf. Interval]	P>z
How long after arrival did it take you/your patient to be attended to by a doctor			
0-5	Reference		
Within 10 minutes	5.266495	0.010065 - 2755.741	0.603
Within 30 minutes	14.21341	0.055631 - 3631.435	0.348
Within 60 minutes	71.80139	0.180149 - 28617.62	0.162
Within 120 minutes	334.2599	0.978125 - 114228.4	0.051
≥121 minutes	407591.8	153.7513 - 1.08E+09	0.001

How long after arrival did it take you /your patient to register with the hospital (Open file)

0-5	Reference		
Within 10 minutes	199.4387	0.17905 - 222149.1	0.139
Within 30 minutes	514.4058	0.346392 - 763913	0.094
Within 60 minutes	2.627722	0.002117 - 3262.143	0.79
Within 120 minutes	0.384112	0.000249 - 592.6413	0.798
≥121 minutes	(empty)		

How long after arrival did it take you /your patient to get any form of medication

0-5	Reference		
Within 10 minutes	2.17666	0.021141 - 224.1126	0.742
Within 30 minutes	0.163166	0.007785 - 3.419991	0.243
Within 60 minutes	1.284836	0.102616 - 16.08726	0.846
Within 120 minutes	(omitted)		
≥121 minutes	(empty)		

How long after arrival did it take you /your patient to get any investigation done

0-5	Reference		
Within 10 minutes	0.002242	5.63E-06 - 0.891872	0.046
Within 30 minutes	0.009624	1.89E-05 - 4.890272	0.144
Within 60 minutes	0.126897	0.000246 - 65.52257	0.517
Within 120 minutes	0.00055	5.85E-07 - 0.516459	0.032
≥121 minutes	0.089187	0.000124 - 64.07854	0.471

Time taken for initial assessment

0-5	Reference		
Within 10 minutes	0.006208	4.29E-06 - 8.992975	0.171
Within 30 minutes	0.015105	9.08E-06 - 25.12999	0.268
Within 60 minutes	0.000631	2.22E-07 - 1.794222	0.069
Within 120 minutes	0.000574	1.98E-07 - 1.667162	0.067
≥121 minutes	0.003237	1.02E-06 - 10.29718	0.164

Time taken for diagnostic procedures (e.g. X-rays lab tests)

0-5	Reference		
Within 10 minutes	(empty)		
Within 30 minutes	0.275533	0.002225 - 34.11437	0.6
Within 60 minutes	0.045627	0.00013 - 15.99541	0.302
Within 120 minutes	0.350469	0.001079 - 113.859	0.722
≥121 minutes	0.029069	9.77E-05 - 8.645445	0.223

Time taken for consultation with specialists

0-5	Reference		
Within 10 minutes	(empty)		
Within 30 minutes	14.22689	0.093346 - 2168.32	0.301
Within 60 minutes	1.693852	0.006976 - 411.2938	0.851
Within 120 minutes	0.695388	0.002698 - 179.2127	0.898
≥121 minutes	14.50945	0.012312 - 17098.91	0.459

Time taken to receive prescribed medications?

	Reference		
0-5			
Within 10 minutes	0.018405	0.0002 - 1.691437	0.083
Within 30 minutes	0.117052	0.001539 - 8.903926	0.332
Within 60 minutes	0.047488	0.000475 - 4.749575	0.195
Within 120 minutes	0.01819	0.000107 - 3.097285	0.126
≥121 minutes	(empty)		

Discussion

This study sought to determine patient waiting time and delays in accessing emergency care at Kwasuth, their associated factors, and how these factors relate to patients' level of satisfaction with medical care received. In this study, the demographic distribution of users of ED at Kwasuth showed that females accounted for 54.89% of the respondents. The finding is similar to what was found by Alhabdan et al. (2019) and Mensah et al. (2024), who showed that females used emergency care services more than their male counterparts in Saudi Arabia and Ghana, respectively. The reason for females accessing emergency services might be gender differences in morbidity, women as primary caregivers, or because they access healthcare on behalf of other members of their family, especially children and elderly people (Olamide et al., 2021). The majority of participants being residents of urban settings (79.62%), agree with the results of Islam et al. (2020) from Bangladesh since Kwasuth is situated in the metropolitan city of Ilorin, which acts as a referral center for patients living in rural areas around Ilorin. The highest occupational category was traders (42.39%), just as observed by Shisundi et al. (2023) in Kenya, implying that people in the informal economy depend on EDs because they cannot access primary healthcare facilities scheduled within their plans. The most prevalent reason for ED presentations was medical emergencies (76.91%). Moderate severity accounted for 52.71% of presentations, which is consistent with observations by Ataman et al. (2023) and Siamisang et al. (2020). This observation indicates that EDs in Ilorin can serve as safety nets for people who do not have critical medical issues because of ineffective primary

healthcare services (Federal Ministry of Health, 2024).

The majority (66.3%) encountered delays. The average time for physicians' assessment was 106 ± 117 minutes. Also, 32.61% waited at least 121 minutes. These delays exceed the World Health Organization's (WHO) recommended 30-minute benchmark for urgent cases. The average is higher than the median entry-to-disposition time of 50 minutes in Haroon et al. (2020) in Pakistan, but similar to the 4.5-hour median doctor waiting time reported by Siamisang et al. (2020) in Botswana. The longest delay was in obtaining the diagnosis (66.85%), followed by waiting to see a doctor (61.68%). These findings match that of Darraj et al. (2023) in Nigeria. Average registration time was 39 ± 38 minutes, and assessment time was 45 ± 45 minutes, comparable to Islam et al. (2020). However, these are higher than figures from Nhdi et al. (2021) in Saudi Arabia, where 73.5% of patients were registered in less than 4 hours. Large standard deviations indicate significant heterogeneity in the patient population. Queuing theory explains these results: random arrival rates and service times create skewed waiting time distributions (Chydzinski & Adamczyk, 2024; Joseph, 2020). Discrepancies between middle-income and high-income countries likely arise from a lack of resources, manual documentation, and staff shortages.

Indeed, the perceived patient-related factors were mainly attributed to the existence of systemic problems in the system, such as a high number of patients (89.14%), communication problems (86.68%), inadequate triage (84.51%), and inadequate supply of equipment (84.51%). This is consistent with a previous study conducted by Mosleh et al. (2025) in the UAE and by Hemmati et

al. (2018) in Iran, where crowding, poor communication, and inadequacy of equipment were reported as important challenges. In contrast to Alhabdan et al. (2019), whose findings indicated lower levels of patient awareness concerning triage, our sample's emphasis was on structural issues, since triage procedures may be less rigidly set out in such environments (Phukubye et al., 2023). A high level of agreement (85.05% and 84.78%, respectively) about the need for efficient coordination and streamlining procedures aligns with the results of Ortiz-Barrios et al. (2023) and Ahsan et al. (2023).

The majority of respondents agreed that delays reduce patient satisfaction (89.13% SA+A) and effectiveness of treatments (91.3% SA+A), while timely treatment enhances effectiveness (87.77% SA+A). These results are supported by Ahmad et al. (2022) and Zhang et al. (2023), who have identified waiting time as the major predictor of patient satisfaction and service quality. It is surprising how only 79.89% of patients considered their experience in the hospital to be "good" despite the delays; however, similar results were reported by Jadhao et al. (2018) and Olamide et al. (2021) in their research conducted in India and Nigeria, respectively. Patients were more grateful for receiving the necessary health services irrespective of the wait times, possibly due to cultural factors, initial low patient expectations, and the availability of other hospitals (Fontova-Almató et al., 2019). Notwithstanding, the results indicating that hospitals should strive to minimize waiting time (90.21% SA+A) suggest patient dissatisfaction with the current level of health services provided, thus supporting Nyce et al.'s (2021) findings on a negative correlation between waiting time and patient experience score, albeit positive overall satisfaction.

Despite the objective delay, 90.22% considered resource allocation as efficient/very efficient, and 75% considered the availability of these resources as sufficient. However, this is contrary to the shortage of resources indicated by the respondents, and in other reports where Nigeria's ED staff complained of a lack of equipment and personnel. This could be attributed to the inability of the patients to assess the adequacy of these technical resources or to the relative comparison when compared with the lower-

resourced primary facilities. A similar "efficiency-satisfaction paradox" was seen by Enabulele et al. (2018), where the patients' satisfaction despite the long wait times could be attributed to the empathic care from the healthcare providers or their efforts. The finding that 18.21% considered the resources as inadequate is supported by Savioli et al. (2022), who found resource scarcity to be one of the global causes of ED overcrowding.

In this study, the females or relatives of female respondents were found to be more satisfied (84.16%) than males (74.70%), $p = 0.024$, which is contrary to the work done by Al-Harajin et al. (2019) but in agreement with Fontova-Almató et al. (2019). The respondents with primary education showed the maximum level of satisfaction (95.24%), whereas those with secondary education had the minimum level (67.57%), $p < 0.001$. The Inverted-U shape between education and satisfaction contrasts with the study of Zhang et al. (2023), who observed a direct relation between education and lower satisfaction levels because of high expectations. This difference might be attributed to the fact that primarily educated people have low expectations, and they appreciate the availability of tertiary health facilities. The Muslims (83.75%) were more satisfied than Christians (68.13%), $p = 0.001$, and Yorubas (82.81%) more than Hausas/Fulani (66.67%) or Igbos (54.17%), $p = 0.001$. There was no relationship between age, income, and severity with happiness, contrary to the findings of Siamisang et al. (2020), which showed that age influenced LOS. This is in line with the null hypothesis stating that there is no significant correlation between sociodemographic characteristics, excluding gender, education,

The findings of the bivariate analysis showed an unexpected relationship where the longer waiting time for vital services was related to greater percentages of "good" patient satisfaction. For instance, while 95.83% of individuals waiting ≥ 121 minutes to visit a physician considered their satisfaction as "good," only 57.14% who waited ≤ 120 minutes did the same ($p < 0.001$). The same trend existed for waiting times in registration, medication, and investigations. It is not supported by other empirical research findings where longer waits led to poorer patient satisfaction (e.g., Nyce et al.,

2021; Alrajhi et al., 2020), except for the study by Jadhao et al. (2018) conducted in India. The possible reasons for such unexpected relationships include triage effects (more severe patients wait longer and are thus more satisfied), survival bias (dissatisfied people left the hospital without treatment), and lower expectations in resource-constrained settings (Biya et al., 2022).

Following adjustment, ages 33-46 years (AOR = 0.05, $p = 0.025$) and ≥ 75 years (AOR = 0.05, $p = 0.044$) were associated with 95% decreased likelihood of being satisfied compared with 18-32 years, while males were associated with 84% lower likelihood compared with females (AOR = 0.16, $p = 0.020$). The finding that the middle-aged group was less likely to be satisfied with healthcare services is consistent with findings from Van der Linden et al. (2023) and can be attributed to the pressure they face with regard to balancing work and family life. It can also be attributed to the fact that they have unfulfilled expectations regarding quick access to services, as reported by Graham, et al. (2023). Instability in the coefficients for "Artisan" and absence of data in the age group of 61-74 indicate limitations typical of LMIC emergency departments (Soldatenkova et al., 2023).

Further multivariable analyses validated complex relationships. Waiting for ≥ 121 minutes before seeing a doctor proved significantly related to satisfaction (p -value = 0.001). However, the adjusted odds ratio of 407,591.8 shows complete separation in the data and thus cannot be taken to estimate the effect size in view of sparse data, as in other cases (Ibrahim, 2022). Conversely, short waiting times before the investigation (10 minutes: AOR = 0.002, p -value = 0.046; 120 minutes: AOR = 0.0006, p -value = 0.032) were linked with lower chances of good satisfaction. These results point to the notion that the clinical urgency of conditions determines patient satisfaction rather than actual waiting times: patients who went through quick examinations probably suffered from minor ailments and had high expectations, whereas patients with serious conditions and requiring hospitalization may feel satisfied after having their concerns resolved despite prolonged waiting times (Cassarino et al., 2019; Yarmohammadian et al., 2022). Confidence

intervals' wide ranges and inability to estimate odds ratios for certain categories show the need for more subjects or employing Firth's penalized regression in further research (Savioli et al., 2022).

Conclusion

The present study sought to evaluate the problem of delay and waiting period in the emergency departments of KWASUTH, a tertiary medical facility located in Ilorin, Kwara State, through analysis of sociodemographic characteristics, degree of emergency, perception of causes, and availability of resources on waiting period and level of satisfaction among clients. It was found out that delay is widespread, affecting two-thirds of clients and having a mean waiting period until doctor evaluation of 106 ± 117 minutes, which is beyond the internationally recommended standard. Overcrowding of patients, poor communication, insufficient triage process, understaffing of workers, and limited equipment were the leading causes of long waiting periods, among other identified factors. Contrary to expectation, an increase in waiting period for various procedures had a positive relationship with satisfaction level, probably due to prioritization of emergencies through triage, low initial expectations, and social desirability bias. While 90.22% found resource allocation to be efficient and 79.89% felt satisfied generally, the difference between actual delays and perceived satisfaction highlights the difficulties involved in evaluating emergency care in areas with limited resources. Therefore, while rejecting the null hypothesis of a lack of correlation between waiting time and sociodemographic characteristics for gender, age, education, religious affiliation, and ethnic identity, there appears to be a nonlinear correlation between waiting time and satisfaction influenced by clinical urgency and expectations. The improvement of emergency care efficiency in Ilorin will involve more than just saving time.

Recommendations

To mitigate delays and improve the quality of care in emergency rooms in Ilorin tertiary hospitals, certain recommendations can be suggested. For example,

hospitals need to enhance their triage processes by ensuring that a nurse-based five-level triaging system exists, which will guarantee proper prioritization without causing any bottlenecks (Phukubye et al., 2023). In addition, electronic medical records and real-time tracking of lab/radiography services must be implemented to overcome the delay of 66.85% in diagnosing patients because digitalization of the healthcare industry helps increase efficiency of patient processing (Ahsan et al., 2023; Ortíz-Barrios et al., 2023). Finally, efforts have to be made towards addressing staffing shortages, which were reported by 82.07% of participants and intensified because of workforce migration (Abubakar et al., 2024). Fourthly, hospitals must formalize the methods of communicating with their patients, such as the display of estimated waiting times and delay information, as 87.23% of the patients felt that information plays a significant role in minimizing the negative consequences (Alrajhi et al., 2020). Fifthly, it is imperative that national policymakers implement the National Strategic Plan for Emergency Medical Services 2024-2028 (Federal Ministry of Health, 2024) through decentralization and development of primary health care systems that will help in the reduction of the visits made by patients to the emergency department for moderate conditions, which accounted for 52.71% of the visits.

Limitations, Mitigation Steps, and Suggestions for Further Studies

There are certain limitations to this study that must be taken into consideration. First of all, due to the cross-sectional nature of this research design, there cannot be any causal linkages established between waiting time and patient satisfaction, while at the same time, the contradictory relationship found can be attributed to confounding factors such as triage category or clinical severity that were not considered in this analysis. Secondly, due to the limited number of observations in the regression model, odds ratios could not be estimated accurately for several waiting time groups. Lastly, response bias can occur because severely ill individuals were not included in the sample.

In order to address these shortcomings, trained research assistants and the time-motion technique were employed to reduce recall bias; pretesting was done for validity; and multivariable analysis was done to control for confounders. Prospective studies should use cohort designs with real-time electronic tracking of patient movements to collect time stamps objectively and relate them to clinical outcomes like 72-hour mortality. Multi-center studies in the various geopolitical regions of Nigeria are necessary to look at regional differences and the effects of hospital-level characteristics. Studies looking into the perceptions of patients and providers about acceptable waiting periods would help to unravel the satisfaction paradox. Additional research should include studies evaluating interventions like triage training, e-queuing, and point-of-care diagnostic tests, among others (Yarmohammadian et al., 2022; Savioli et al., 2022).

Acknowledgements

The authors acknowledge all of the students that participated in this study, who gave their consent and responded to the questionnaire. The support and cooperation of the class representatives of each academic levels in all the selected department in mobilizing and coordinating their colleagues during the period of this study are well appreciated.

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All the authors approved the final version of the manuscript and agreed on its publication.

Financial Disclosure

The authors declared that no financial support was received for this study.

Conflict of Interest

The authors declare that there is no conflict of interest.

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