

Patients' Perceptions and Experiences of Medical Laboratory Service Quality in the Kumasi Metropolis, Ghana: A Convergent Parallel Mixed-Methods Study

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Abstract

Background: In recent years, laboratory services have become a significant feature of health care delivery in many developing countries. In Ghana, laboratory service provision has increased across private and public facilities. The study examined patients' perceptions of quality and their experiences with medical laboratory services in the Kumasi metropolis, Ghana.

Methods: The study employed a convergent parallel mixed-methods design. A survey of five hundred and thirty-nine (539) patients accessing medical laboratory services at Komfo Anokye Teaching Hospital (KATH), Ghana Health Service, Christian Health Association of Ghana (CHAG), Private Hospitals and Private Standalone Laboratories was conducted from 8th March to 26th November 2021. The Service Quality (SERVQUAL) model was used to measure patients' perceptions of laboratory service quality across the five dimensions of Reliability, Assurance, Tangibility, Empathy, and Responsiveness. In addition, fourteen (14) in-depth interviews were conducted with patients to explore perspectives on the provision of quality medical laboratory services. SERVQUAL was calculated as the difference between perception and expectation for each dimension; a negative score indicates dissatisfaction, while a positive score indicates satisfaction. Descriptive statistics and quantile regression analysis were conducted to examine patient-related factors that influence perceptions. Qualitative data were analyzed thematically, and relevant statements were quoted verbatim.

Results: Quantitative findings: The study included 539 patients; 30.2% were male, and 69.8% were female. Patients' expectations exceeded their perceptions of laboratory service quality, with an overall SERVQUAL score of -0.60. The largest gap (-0.66) was in the Responsiveness dimension, and the smallest (-0.57) was in the Assurance dimension. Facility type and sex were significantly associated with patients' perceptions of laboratory service quality. Patients were more satisfied with laboratory service quality in private health facilities than in Government facilities ($\beta = 0.26$; 95% CI: 0.04-0.47; $p = 0.02$). Similarly, females were more satisfied with service quality than male participants ($\beta = 0.23$, 95% CI: 0.04, 0.41, $p = 0.02$).

Qualitative findings: Patients expressed dissatisfaction with the timeliness of results, the unavailability of requested tests, and the lack of communication and feedback.

Conclusion: Patients rated services favourably, but expectations consistently exceeded the service experience, with the largest gap in Responsiveness.

Introduction

Ghana has made significant strides to improve and ensure equitable access to quality healthcare services through several strategies that place patients at the centre of care [1]. Patient-centred care is one of the pillars of quality healthcare, alongside safety, timeliness, effectiveness, efficiency, and equity[2]. Furthermore, patients' experiences of care are fundamental to the provision of quality healthcare [3].

Laboratory services play a crucial role in modern healthcare by providing essential diagnostic information for treatment and patient management. As demand for high-quality healthcare services continues to rise, there is a growing need for efficient, reliable, and patient-centred laboratory services [4]. Establishing robust patient engagement is essential because it serves as a communication channel to improve laboratory service quality and patient safety [5, 6]. Patient perception of service delivery reflects patients' participation in decision-making and their role as partners in enhancing the quality of laboratory services[7]. Monitoring patient opinions about services is a crucial and valuable means of enhancing the quality of medical laboratories [8].

Factors such as turnaround time, diagnostic accuracy, communication with healthcare providers, accessibility, and overall service efficiency affect patient satisfaction with laboratory services [4]. A satisfactory laboratory experience may enhance patient confidence in the healthcare system and encourage adherence to medical advice, leading to better clinical outcomes [4]. Conversely, dissatisfaction with laboratory services may delay diagnoses, reduce treatment adherence, and erode patient confidence in medical care [9].

Although patients are an important and indispensable source of evidence for identifying gaps and developing effective interventions to improve the quality of laboratory services, research on patients' perspectives on the quality of medical laboratory services in Ghana remains scarce. Given the critical role patients play in the laboratory diagnostic value chain, understanding gaps in the provision of medical laboratory services from the patient's perspective is vital for continuous quality improvement and strategic planning. This study examined the quality of medical laboratories from the patient's perspective and identified factors that influence service quality.

Conceptual framework

The study's conceptual framework is based on the Service Quality (SERVQUAL) model (Fig. 1). The SERVQUAL model is a comprehensive tool for measuring customers' expectations and perceptions of service across five dimensions (Reliability, Assurance, Tangibles, Empathy, and Responsiveness), which are considered to reflect service quality [10]. SERVQUAL measures the extent to which customers' quality expectations are met or not met during their service experience [11]. Based on the expectancy-confirmation paradigm, customers evaluate their satisfaction by comparing their expectations with their experience during an interaction [12]. When service falls short of customer expectations, it results in a perceived lower quality of service, leading to customer dissatisfaction [13]. Perceived service quality is the difference between service expectations and actual service performance, known as the gap. A positive gap denotes satisfaction, and a negative gap denotes service dissatisfaction. We hypothesised that facility type and patients' sociodemographic characteristics, such as age, sex, education, income, employment status, and marital status, could predict perceptions of service quality.

Methods

Study design and setting

The study employed a cross-sectional design with a convergent parallel mixed-methods approach to gather and analyse the data. This involved collecting both quantitative and qualitative data, analysing them separately, and then comparing the results to determine whether the findings were related [14]. This approach allows for an in-depth investigation of the research problem and the discovery of new, significant themes and participant viewpoints. The study was conducted in the Kumasi Metropolis, Ashanti Region, Ghana. Kumasi is the second-largest city in the country and the administrative capital of the Ashanti Region. The region's central position makes it accessible from all corners of the country. Kumasi was chosen for the study because it serves as a major referral centre for adjoining communities and provides a blend of all healthcare facilities. According to the District Health Information Management System II (DHIMSII), the metropolis has about two hundred and eighty-three (283) healthcare facilities, comprising hospitals, health centres, and clinics. One hundred and thirty-nine (139) are government, one hundred and thirty-three (133) private, and eleven (11) CHAG. Additionally, according to the Association of Private Medical Laboratories (APML), there are twenty-five (25) standalone private medical laboratories in the metropolis. However, only hospitals that provide medical laboratory services and standalone medical laboratories were recruited for the

study. Hence, the study was conducted at Komfo Anokye Teaching Hospital, Ghana Health Service Hospitals, Christian Health Association of Ghana(CHAG) Hospitals, Private Hospitals, and Private Standalone Laboratories.

Study population, sample size and sampling

The study population were patients accessing medical laboratory services at selected healthcare facilities. The following formula was used to estimate the sample size for the quantitative data collection

$$n = \frac{Z^2 p(1-p)}{d^2} X strata X (r + 1)$$

For the qualitative study, fourteen (14) in-depth interviews were conducted across different types of healthcare facilities, namely, Private, Government, CHAG, and Standalone Private Laboratories. Saturation was used to determine the number of study participants. Purposive sampling was used to select respondents. Data was collected from participants accessing laboratory services at selected healthcare facilities from 8th March to 26th November 2021.

Data collection

Quantitative data

A standardized, structured questionnaire was designed to collect data from participants to elicit information on demographics and other factors that may influence their perceptions of the quality of medical laboratory services. The questionnaire also incorporated a modified version of the SERVQUAL scale, including the service quality dimensions of tangibles, reliability, responsiveness, assurance, and empathy[11,15]. A five-point Likert scale (1 = Very poor; 2 = Poor; 3 = Fair; 4 = Good; 5 = Excellent) was used to measure expectations and perceptions of quality laboratory services. An estimated Cronbach’s Alpha was reported for each dimension as follows: Tangible 0.91, Reliability 0.88, Responsiveness 0.92, Assurance and Empathy 0.89, exceeding the level of acceptance of 0.700 [16], indicating good reliability in assessing the perceived quality of medical laboratory services. The study’s application of the SERVQUAL dimensions and attributes is described in Table 1. The survey questionnaire was administered by three trained research assistants and took at least 30 minutes.

Table 1: The Study’s Application of the Five Service Quality Dimensions and Descriptions

Dimensions	Description	Examples in Medical Laboratory Services
Tangibility	The appearance of the physical environment, equipment, and personnel	Availability of modern equipment, a clean and appealing waiting area, washrooms, and professionals who are neatly dressed.
Reliability	Delivering services as promised accurately	Laboratory operation hours requested tests, tests performed correctly and accurately
Responsiveness	Delivering services promptly and the ability to resolve complaints	Providing accurate information regarding sample collection and testing, and the provision of prompt services
Assurance	Competency, courtesy, credibility, and security	Skilled and competent professionals, respectful and friendly, feel safe, and maintenance of privacy and confidentiality
Empathy	Access, understanding the customer, and individualized attention	Professionals are helpful and understand the needs of the customer

Qualitative data collection

A semi-structured interview guide was developed using the same framework, the SERVQUAL construct. Interviews were conducted by experienced research assistants and supervisors. Interviews were conducted in a language familiar to participants, tape-recorded, and transcribed. The average interview time was 30 minutes.

Data Analysis

Data was imputed in Microsoft Excel, coded, and analyzed using Stata version 15 (StataCorp LLC). The mean expectation and perception score for each participant was calculated as the average of all expectation and perception items. SERVQUAL was calculated by subtracting expectation from perception for each dimension; a negative score indicates dissatisfaction, while a positive score indicates satisfaction. The Wilcoxon signed-rank test was used to assess differences in patients expected and perceived perceptions. The association between the independent variables and SERVQUAL was tested using quantile regression that modelled the median.

Braun and Clark's multistage thematic analysis[17] was used to analyze the qualitative data. This approach involves: familiarization with the raw data, generating initial codes, searching for themes, reviewing themes, and describing themes and subthemes to create an argument and draw conclusions. Interviews were transcribed verbatim into Microsoft Office and double checked for accuracy. The transcribed document was read multiple times, and codes or categories were assigned to pieces of data using NVIVO software. Themes were identified by interpreting the data, developing arguments, sorting codes, and converting codes into themes and subthemes to form an overarching theme. Themes were created based on prevalent phrases and comparable statements. After classifying significant statements under the created themes, each theme was carefully examined for relevance. A statement that did not fit a specific theme was thoroughly reviewed for relevance and, if it did not address the study's objective, was removed entirely. Relevant statements were quoted verbatim to reflect the participant's impressions and explanations.

Results

Quantitative findings

Sociodemographic Characteristics of Study Participants

The quantitative study included 539 patients; 30.2% were male, and 69.8% were female. The mean age of the entire population was 35.6 ± 14.7 years, and most participants were married (57.7%). More than 95% of participants had attained at least primary education. Most participants (70.5%) were employed, and the majority (46.5%) earned less than GHC 1000 per month. Most participants (32.1%) accessed laboratory services at government-owned primary healthcare facilities (Table 2)

Table 2
Sociodemographic Characteristics of Study
Participants

Characteristics	N(539)	Percentage (%)
Age		
< 20	38	7.1
20–29	193	35.8
30–39	142	26.3
40–49	73	13.5
> 50	93	17.3
Sex		
Male	163	30.2
Female	376	69.8
Facility type		
Government	278	51.6
CHAG	84	15.6
Private	135	25.0
Standalone	42	7.8
Employment status		
Employed	380	70.5
Unemployed	125	23.2
Others	34	6.3
Education		
None	26	4.8
Primary	68	12.6
JHS/SHS	307	57.0
Tertiary	138	25.6
Monthly income		
< 1000	251	46.6
1001–2000	204	37.8
> 2000	84	15.6
Marital status		
Single	180	33.4
Married	311	57.7

Characteristics	N(539)	Percentage (%)
Age		
Divorced	8	1.5
Widowed	33	6.1
Others	7	1.3
Frequency of visit		
Once	242	44.9
Twice	163	30.2
>twice	117	21.7
Not sure	17	3.2

SERVQUAL Analysis of Patients' Perception

Expectations were high across all five dimensions, with an overall mean expectation score of 4.6 out of 5 and a peak of 4.57 in the Assurance dimension. Perceptions were lower but still sat in the favourable range, averaging 4.0 overall and again highest for Assurance at 4.02, which on the response scale corresponds to a rating of good. The distance between the two is the quantity of interest.

Across every attribute, perceptions fell short of expectations, producing a negative gap throughout. The overall SERVQUAL score was – 0.60. Widest in the Responsiveness dimension at – 0.66 and narrowest in Assurance at – 0.57, the gaps for the remaining three dimensions fell between these two values, and none of the five returned a positive gap. The Wilcoxon signed-rank test showed that the difference between expectation and perception was statistically significant for each of the 24 attributes ($p < 0.001$) (Table 3).

Table 3
Differences in the perception and expectation of patients

Dimension	Service Attributes	Perception	Expectation	Gap	Wilcoxon signed-rank test	
		Median(IQR)	Median(IQR)	Median(IQR)	Z-Value	p-value
Tangible	Clean physical environment	4(4,4)	5(4,5)	0(-1,0)	-15.3	0.00
	Clean and appealing waiting area	4(4,4)	5(4,5)	-1(-1,0)	-14.9	0.00
	Toilet facility is available and clean	4(3,4)	5(4,5)	-1(-1,0)	-15.7	0.00
	Accessibility of laboratory location	4(4,4)	5(4,5)	0(-1,0)	-14.1	0.00
	Modern diagnostic equipment	4(4,4)	5(4,5)	-1(-1,0)	-15.5	0.00
	Appearance Laboratory personnel	4(3,4)	5(4,5)	-1(-1,0)	-14.5	0.00
Average Score		3.99	4.57	-0.58		
Reliability	Service operation hours	4(3,4)	5(4,5))	-1(-1,0)	-16.4	0.00
	Availability of requested laboratory test	4(3,4)	5(4,5)	-1(-1,0)	-15.6	0.00
	Perform test correctly	4(4,4)	5(4,5)	-1(-1,0)	-14.6	0.00
	Test Referral services	4(4,4)	5(4,5)	-1(-1,0)	-15.0	0.00
	Overall quality of laboratory services	4(4,5)	5(4,5)	-1(-1,0)	-15.2	0.00
Average Score		3.94	4.57	-0.64		
Responsiveness	Clear and understandable information regarding sample collection and testing	4(4,4)	5(4,5)	-0.5(-1,0)	-15.2	0.00
	Provision of prompt services	4(3,4)	5(4,5)	-1(-1,0)	-15.3	0.00

Dimension	Service Attributes	Perception	Expectation	Gap	Wilcoxon signed-rank test	
		Median(IQR)	Median(IQR)	Median(IQR)	Z-Value	p-value
	Information on results dispatch	4(3,4)	5(4,5)	-1(-1,0)	-14.5	0.00
	Resolution of complaint	4(4,4)	5(4,5)	-1(-1,0)	-15.6	0.00
Average Score		3.88	4.54	-0.66		
Assurance	Skill and Competent of personnel	4(4,5)	5(4,5)	-1(-1,0)	-15.1	0.00
	Respect and courtesy of personnel	4(4,5)	5(4,5)	0(-1,0)	-13.3	0.00
	Maintenance of privacy and confidentiality	4(4,4)	5(4,5)	0(-1,0)	-14.2	0.00
	Feel safe in the performance of laboratory procedure	4(4,4)	5(4,5)	0(-1,0)	-14.0	0.00
	Maintenance of records for easy retrieval	4(4,4)	5(4,5)	-1(-1,0)	-14.5	0.00
Average Score		4.02	4.59	-0.57		
Empathy	Helpful, caring, and friendly personnel	4(4,4)	5(4,5)	0(-1,0)	-14.7	0.00
	Personnel are attentive and understand the needs of patients	4(3,4)	5(4,5)	-1(-1,0)	-14.6	0.00
	No discrimination in service provision	4(4,4)	5(4,5)	-1(-1,0)	-13.8	0.00
Average Score		3.95	4.55	-0.60		

Patients' Perception of Service Quality Dimensions by Facility Type

There were significant differences in the following service quality dimensions across facility types: Responsiveness ($p = 0.02$), Assurance ($p = 0.05$), and Empathy ($p = 0.00$). However, there were no significant differences in the Tangible ($p = 0.31$) and Reliable ($p = 0.11$) service quality dimensions across facility types (Table 4)

Table 4
Patients' perception of service quality dimensions by facility type

Service quality dimension	Facility type	Service Quality Score	
		Median (IQR)	p-value
Tangible			
	Government	-0.6(-1,0)	0.31
	CHAG	-0.4(-0.9,0)	
	Private hospital	-0.5(-1,0)	
	Private laboratory	-0.6(-1, -0.3)	
Reliability	Government	-0.8(-1,0)	0.11
	CHAG	-0.5(-0.8,0)	
	Private hospital	-0.6(-1,0)	
	Private laboratory	-0.7(-1,0)	
Responsiveness	Government	-0.8(-1,0)	0.02
	CHAG	-0.5(-1,0)	
	Private hospital	-0.5(-1,0)	
	Private laboratory	-0.6(-1,0)	
Assurance	Government	-0.5(-1,0)	0.05
	CHAG	-0.5(-1,0)	
	Private hospital	-0.2(-1,0)	
	Private laboratory	-0.8(-1.0)	
Empathy	Government	-0.7(-1,0)	0.00
	CHAG	-0.3(0.9,0)	
	Private hospital	-0.3(-1,0)	
	Private laboratory	-0.8(-1,0)	
Overall quality service	Government	-0.6(-1,-0.0)	0.21
	CHAG	-0.4(-0.9,-0.1)	
	Private hospital	-0.4(-0.9,-0.0)	
	Private laboratory	-0.8(-1.-0.1)	

Factors associated with patients' perception of laboratory Service Quality

Upon adjustment for variables of interest in the quantile regression analysis, facility type and sex were significantly associated with the patient's perception of laboratory service quality (Table 5). Satisfaction with services at private

hospitals was higher than at government health facilities ($\beta = 0.26$, 95% CI: 0.04, 0.47, $p = 0.02$). Similarly, compared with male participants, female participants reported higher service satisfaction ($\beta = 0.23$, 95% CI: 0.04, 0.41, $p = 0.02$).

Table 5
Factors associated with patients' perception of laboratory service quality

Variable	coefficient (95% CI)	P-value
Facility type		
Government	0	
CHAG	0.15(-0.08,0.39)	0.20
Private hospital	0.26(0.04,0.47)	0.02
Private Laboratory	0.04(-0.41,0.32)	0.80
Age		
< 20	0	
20–29	-0.00(-0.44,0.43)	0.99
30–39	0.09(-0.41,0.58)	0.73
40–49	0.00(-0.53,0.53)	0.99
> 50	0.27(-0.24,0.79)	0.30
Sex		
Male	0	
Female	0.23(0.04,0.41)	0.02
Education		
None	0	
Primary	0.10(-0.35,0.54)	0.67
JHS/SHS	0.31(-0.12,0.74)	0.16
Tertiary	0.34(-0.13,0.80)	0.16
Employment status		
Employed	0	
Unemployed	-0.10(-0.34,0.15)	0.44
Others	0.19(-0.27,0.64)	0.42
Income		
1000 or less	0	
1001–2000	-0.04(-0.26,0.18))	0.71
2001 or more	-0.08(-0.41,0.24)	0.63
Marital status		
Single	0	

Variable	coefficient (95% CI)	P-value
Facility type		
Married	-0.07(-0.33,0.20)	0.62
Divorced	0.36(-0.34,1.07)	0.31
Widowed	0.10(-0.60,0.38)	0.69
Other	0.07(-0.64,0.79)	0.84
Frequency of visit		
Once	0	
Twice	-0.02(-0.21,0.18)	0.86
>twice	-0.16(0.38,0.06)	0.16
Not sure	0.06(0.53,0.41)	0.79

Qualitative Findings

Fourteen (14) patients participated in the in-depth interviews; 14.3% were male, and 85.7% were female. The majority (42.9%) of participants were from government hospitals (Table 6).

Table 6
Sociodemographic characteristics of participants

Variable	Category	Frequency
Sex	Male	2
	Female	12
Age	18–25	5
	26–33	5
	34–41	4
Facility type	Government	6
	CHAG	3
	Private hospital	3
	Private laboratory	2

The themes identified are tied to the SERVQUAL model: Tangible, Responsiveness, Reliability, Assurance, and Empathy. Under each broad theme, subthemes applicable to medical laboratory services are categorized.

Tangible

Environment and facilities

Most patients reported that the physical environment, waiting area, sample collection area, and restroom cleanliness were not conducive.

“The laboratory space is inadequate to accommodate the number of people coming for their test, compromising privacy and cleanliness” (Government Hospital, Patient).

The waiting area is quite small and can accommodate only a limited number of patients at a time. This puts us at risk of infection, especially during the COVID-19 pandemic. Therefore, if we are not careful, we might contract a disease by the end of the day (Government, Patient).

Accessibility

Patients reported varied experiences with laboratory accessibility. Many from the teaching hospital encountered difficulties due to the fragmented nature of services, while those in smaller facilities reported easier access.

“Finding the laboratory can be challenging, as you may be directed to various locations before locating it. As an ulcer patient, I spent a long time searching for the lab. I'm feeling hungry, but I need to take the test before eating, so I have to wait longer (Government Hospital, Patient).

“I had no trouble finding the lab, thanks to clear directional signs” (Private Hospital, Patient).

Assurance

Competency & Knowledge

Most patients believe that laboratory professionals possess the requisite knowledge and competency to provide services. However, some express dissatisfaction with their proficiency in certain instances.

“They must be well-trained and apply their knowledge to their work. Otherwise, the hospital managers would have dismissed them” (Private Hospital, Patient).

“I have some concerns about the staff's competence, given the delays in receiving results and being referred elsewhere. It seems they may not have the necessary expertise to perform certain tests, which is why they have to send us elsewhere. To ensure quality, it would be helpful if their supervisors could visit the facility to oversee the work. Many patients are becoming increasingly frustrated with the constant excuses” (Government Hospital, Patient).

Friendliness & courteousness

Most patients perceived laboratory professionals as friendly, respectful, and courteous. However, one participant reported dissatisfaction with some patients being allowed to jump the queue with the help of laboratory professionals.

“The staff at this facility are friendly, respectful, and courteous. They are highly trained to treat everyone with respect and dignity, regardless of who they are” (Private Hospital, Patient).

“Sometimes people do not follow the queue, and laboratory personnel give special treatment to others, allowing them to go ahead. This is unprofessional and goes against the first-come, first-served principle. We are all equal, and I often argue with those who violate this rule” (Government Hospital, Patient).

Empathy

Attitude of laboratory personnel

Most patients expressed dissatisfaction with the lack of care and attention provided during services.

"Personnel did not provide any explanation before and after taking my sample" (Government hospital, Patient).

"Some staff members may occasionally exhibit poor attitudes and be rude to patients, but I believe this is an isolated issue. However, it is not a major concern for us since we will not always be in this place. On the other hand, I appreciate the demeanour of the staff, who remained calm and professional when I expressed my dissatisfaction with the delay." (Government Hospital, Patients)

Reliability

Accuracy & reliability of results

Even though patients may not be knowledgeable about this aspect of their care, they nonetheless express satisfaction or dissatisfaction with their experiences with laboratory results. Additionally, some participants have shared their real-life experiences regarding the accuracy of test results.

"I understand that the laboratory personnel seem to be performing the tests correctly. Although I don't see the results, I trust they are accurate because my doctor uses them to treat me without any complaints." (CHAG Hospital, Patient).

"During my last visit to the lab for a pregnancy test, I received a positive result. However, I later found out that I was not pregnant. This has caused me to question the accuracy of the lab personnel's testing procedures. I am uncertain about their results and feel they may not always perform the test correctly" (CHAG Hospital, Patient).

Scope of laboratory testing

Most patients who use government-owned facilities are dissatisfied with the laboratory test menu and often need to be referred to other laboratories to have all requested tests performed, which strains their financial resources and overall care. By contrast, patients who use private health facilities report being able to have all laboratory investigations performed at the facility's laboratory and express satisfaction with their experience.

"I often can't get all the required lab tests done at this facility. Today, I paid for the tests, but they later informed me that one couldn't be conducted here and suggested I go elsewhere, which is frustrating and costly." (Government Hospital, Patient).

"My sister recommended this hospital because they conduct all necessary tests in-house, unlike others that redirect patients to different labs. This has saved me a lot of hassle and time" (Private Hospital, Patient).

Responsiveness

Communication and feedback

Clear communication is critical to customer satisfaction. Some participants reported a lack of interaction during laboratory procedures, while others were satisfied with the feedback from laboratory professionals.

"Whether personnel are willing to provide answers and explanations during a test varies" (Government Hospital, Patient).

"They just call my name, take my sample and give me the results later, and I go and give it to the doctor. So, there isn't much interaction with them" (Government Hospital, Patient).

Timeliness of results

Most patients were dissatisfied with the laboratory's test turnaround time. They attributed the delay to staff shortages and outdated equipment.

"I am dissatisfied with the timeliness of the laboratory services in this facility. The delay is too much, and it's frustrating. I came from a faraway place and have already been waiting for over two hours, but my results are still not ready. By the time I receive them, the doctor will have closed. This delay is irritating, and I hope they can improve their services" (**Government Hospital, Patient**).

"Obtaining timely results is a major challenge. Although the cause of the delay is unclear, we never receive the results on time, and waiting for them can consume an entire day. It seems likely that the machines they are using are insufficient. I don't believe it's a matter of the number of people working there" (**Government Hospital, Patient**).

Participants from private health facilities do not face challenges with turnaround time as the lab communicates the expected time of result delivery based on the type of test requested.

"The testing facility will provide you with an estimated time for when your results will be ready, as each test goes through a specific process. Therefore, I don't blame them in case of any delay. However, in general, they deliver the results on time. Even with the test I took, I will bring it to the doctor on my next visit, but he told me it could be available in just a few minutes" (**Private Hospital, Patient**).

It also emerged from the interviews that frequent equipment breakdowns and reagent shortages are significant barriers to providing quality medical laboratory services. Participants expressed dissatisfaction with these occurrences.

"They asked me to perform a test outside the facility because their machine was not functioning" (**Government Hospital, Patient**).

"I inquired why we were directed to a different lab for additional tests despite being in a larger hospital. They told me that they often run out of the reagents and that is why they refer patients to private labs. That's a huge problem, and I wonder why they take money, but they can't use that to buy the reagents to work with. After waiting for my results here, I have to go to another lab for another test, it's so bad" (**Government Hospital, Patient**).

Triangulation of the Mixed Method Framework

The results show that quality gaps exist across all the quality service dimensions and attributes of medical laboratory service provision, indicating that medical laboratories were not meeting the expectations of their clients.

In the quantitative approach, the biggest gap (-0.66) was in the Responsiveness dimension and the lowest gap (-0.57) was observed in the Assurance dimension. On the other hand, the qualitative approach provided access to subjective perspectives on the quality of medical laboratories from patients' personal experiences regarding providing medical laboratory services in healthcare. Although the lowest quality service was observed in the responsiveness dimension, interviews provided details and personal experiences of patients' strong dissatisfaction with the timeliness of laboratory services, which is cardinal to the provision of quality medical laboratory services. Additionally, the qualitative approach provided further insight into the Assurance dimension, in that patients acknowledged that laboratory professionals are knowledgeable and competent, but doubt their competencies in some instances, giving information on how this can help in quality improvement strategies.

The quantitative approach in this study complements and contextualizes the qualitative approach in that analysing the assessment data helped document the relevance and extent of the problem of quality medical laboratory services. This approach provides a more solid ground for investigating the quality of medical laboratories, and the interviews permitted an analysis of the quality service dimension and attributes as perceived by the participants. The quantitative analysis of quality service data revealed discrepancies between the expectation and perception of quality service provision, justifying the need for quality service improvement intervention strategies.

Discussion

This study examined the quality of medical laboratory services from the patient's perspective and identified factors that influence service quality. The mixed methods approach adopted in this study permitted a broader understanding of quality laboratory service gaps and how to deal with these gaps to improve laboratory services and, consequently, quality healthcare.

Generally, patients' expectations outweighed their perceptions of quality laboratory services, with negative SERVQUAL scores across all dimensions and service attributes, indicating that medical laboratories were not meeting their clients' expectations and that clients were dissatisfied with service quality. Facility type and sex were significantly associated with the patient's perception of laboratory service quality.

There were significant differences in perceptions and expectations for all twenty-four (24) service attributes (p -values < 0.001), indicating that expectations for the services provided exceed perceptions (actual performance) of the services. This suggests that numerous service improvement initiatives must be undertaken to improve the quality of laboratory services. This has been identified in previous studies [18–22], where expectation of service quality exceeded actual performance, leading to dissatisfaction.

The highest-rated quality dimension was Assurance, denoting competent, knowledgeable and courteous laboratory professionals. This suggests that participants were less dissatisfied with the competency of laboratory professionals and trusted the services provided. This reflects patients' expectations for laboratory professionals to be competent and knowledgeable in their practice. This supports other studies indicating that patients prioritize competence and professionalism as vital indicators of quality service [23]. Other studies suggest that Assurance is the most critical quality dimension in service quality ratings [24]. Contrary to this finding, other service quality studies found reliability to be the highest-rated quality dimension [25, 26]. The literature notes that the quality ratings of the five dimensions depend mainly on the study's environment and the service encounter; these ratings are not universal, which is one of the model's drawbacks [23, 25]. However, it is a valuable tool for service quality gap analysis and provides vital data for quality improvement.

The lowest quality rating in this study was the Responsiveness Dimension, which measures the willingness to help customers and provide timely service and communication. The findings suggest that customers expect more from the Responsiveness Dimension of medical laboratory services, making it a major concern and a good starting point for laboratory service improvements. This was corroborated by the qualitative data, which showed that participants expressed dissatisfaction and frustration with the timeliness of results at most of the laboratories surveyed. This substantiates findings from other studies [22, 27, 28]. Other studies suggest that communication significantly affects the service quality gap [23]. Additionally, studies have shown that it is advantageous to include patients as active members of the diagnostic team to ensure a prompt, correct diagnosis and to help spot errors that may occur [5, 29]. Adu (2021) found that the lack of laboratory space is a significant barrier to patients' laboratory interactions, which was also a major concern expressed by patients in this study [28]. Goula et al. (2021) assert that the main factors that affect the patient's perception of quality are open communication, individualized attention, responsiveness to

their needs, respectful behaviour, and a trustworthy environment [20]. To improve the quality of medical laboratory services and patient safety, it is crucial to establish a strong patient engagement programme within the laboratory system and create avenues for patient interaction. Professionals working in laboratories will be better equipped to meet patient expectations through regular training and continuous professional education and development.

The study found that facility type is significantly associated with the patient's perception of laboratory service quality. Satisfaction with laboratory services was higher in Private Hospitals than in Government health facilities. This finding was strongly supported by the qualitative data, with participants in private facilities reporting satisfaction with laboratory service quality more than those in government facilities. Previous studies reported similar findings [30, 31]. Evidence suggests that patients value the quality and convenience of private health care.

Sex of participants was significantly associated with patients' perception of laboratory service quality; compared with male participants, females reported higher satisfaction. This contradicts the findings of Fatma et al. (2021), who reported that males were more satisfied with healthcare quality than females. Other studies have found that sex is associated with healthcare quality [32–35]. This suggests that implementing quality improvement interventions must be tailored to enhance effectiveness. These findings suggest that provider, patient, and health system-level factors may be critical drivers of socioeconomic gaps in the healthcare experience. Promoting quality medical laboratory services and overall good health outcomes may require addressing these socioeconomic gaps in the provision of medical laboratory services. However, given that sex and facility type were not adjusted for, these findings are hypothesis-generating, requiring further investigations.

The study utilized a mixed-methods design, which allowed for a more comprehensive investigation of patient perspectives and experiences. The use of the SERVQUAL model allowed for a standardized and structured approach to measuring service quality. Nonetheless, an issue to consider in the interpretation of the study's findings is that the study only focused on one out of sixteen regions and used the Kumasi Metropolis, which is an urban area. This approach might affect the representativeness and generalization of the study's findings.

Conclusion

Patients rated services favourably, but expectations consistently exceeded experience of service, with the gap largest in Responsiveness. It is imperative for healthcare organizations, in general, and medical laboratories, in particular, to promote and develop continuous improvement strategies within the medical laboratory setting to enhance the patients' experience and the overall quality of health care.

Declarations

Ethics approval and consent to participate

The study was conducted in accordance with the Declaration of Helsinki. The study received ethical approval from the Ghana Health Service Ethics Review Committee (Reference #: GHS-ERC: 014/11/20) and the Komfo Anokye Teaching Hospital Institutional Review Board (IRB) (Reference #: KATH IRB/AP/155/20). Permission was obtained from the Kumasi Metro Health Directorate and the Municipal Health Directorate of the selected health facilities. Written informed consent was obtained from all participants before data collection commenced. The privacy and confidentiality of study participants were ensured by safeguarding the collected data and using codes instead of facility names.

Consent for publication

Not applicable

Availability of data and materials used

The data sets used during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests

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Authors contribution

The study was conceptualized by E. S, G.C. A, M.D, J.N., M.O.M., and F.K.B.S. Data collection was supervised by E.S. Data curation and analysis were conducted by E.S and M.O. M., with methodological support and guidance from G.C.A, M.D., J.N., and F.K.B.S. Data interpretation was performed by E.S, M.O.M., G.C.A, M.D, J.N and F.K.B.S. The first draft of the manuscript was written by E.S. All authors reviewed and edited the manuscript, with high-level critical review provided by GCA, MD, J.N and M.O.M. All authors read and approved the final version of the manuscript.

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Figures

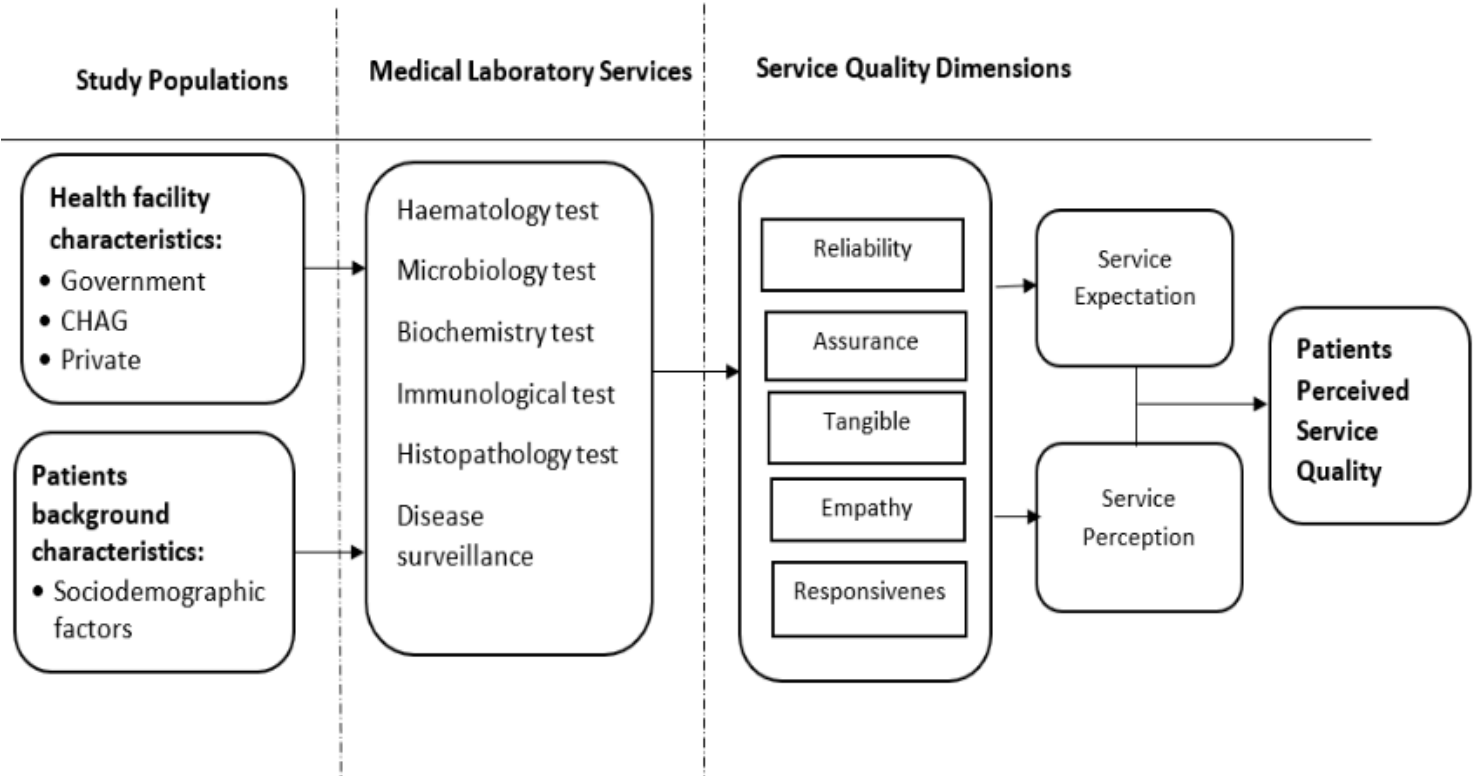


Figure 1

Supplementary Files

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