

# Nurses' Perception on Healthcare Services Quality in Mission Hospitals in Kiambu County, Kenya

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## Summary

#### BACKGROUND

Despite adoption of quality improvement initiatives in Kenyan Health facilities, quality gains are not yet optimal in both public and private sector. The private sector, which includes mission hospitals, face myriad of challenges ranging from perception of poor regulation to unqualified staff and gaps in quality of care.

### **PURPOSE**

To assess nurses' perception on healthcare services' quality in mission hospitals in Kenya. METHOD

A descriptive cross-sectional study using quantitative and qualitative methods of data collection. Simple random sampling was used to select 188 nurses for administration of self-administered questionnaire. A total of 20 in-depth interviews and 4 focus group discussions were conducted. Descriptive statistics and linear regression analysis were used to analyze quantitative data using SPSS v20. Qualitative data was analyzed thematically using Nvivo v11.

### **RESULTS**

Overall nurses' perception of quality of services was 3.62. The perceived quality of services processes was 3.5187. Length of patient-provider interaction ( $\beta$ =0.225, t=4.761, p=0.001), teamwork ( $\beta$ =0.170, t=3.550, p=0.001), upholding patients' rights ( $\beta$ =0.178, t=3.773, p=0.001), capacity to conduct quality assessment ( $\beta$ =0.125, t=2.510, 0.013) and availability of effective quality improvement teams ( $\beta$ =0.550, t=12.556, p=0.001).

### CONCLUSION

Nurses' perceived quality of services to be fair with a substantial room for improvement. To achieve a competitive edge, it is imperative for the hospital's management to engage visionary and quality conscious leaders, capable of identifying quality gaps and implementing improvement initiatives. The initiatives should focus on institutionalizing team-based quality audits, developing a quality patient-focused culture in service delivery.

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## Introduction

Healthcare service industry is one of the fastest growing in both developed and developing countries to meet the needs and demands of people in an economy [1]. The mission of health systems has expanded to meet the population's health needs and expectations regarding to how patients should be treated by providers [2].



In this context, staff and patients attitudes and opinions has become an important aspect of evaluating the capability of healthcare systems to provide high standards of care as required in the regulatory and operational frameworks such as Constitution of Kenya 2010 [3] and Kenya Health Policy Framework 2014 - 2030 [4].

These regulatory frameworks recognize the strategic and operational importance of health professional like nurses and their invaluable inputs in health service delivery.

Quality in health services can be described as the degree to which health care services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge [2,5].

Quality of healthcare services provided is determined by ability to deliver and maintain acceptable standards. Essential elements of high-quality healthcare services include inputs such as infrastructure and distribution of medical service equipment and medical commodities; provider efforts such as provider availability, service decentralization arrangements, supervision and management structures; and provider ability such as diagnostic accuracy, adherence to clinical guidelines [6,7].

Healthcare service quality standards and assessment criteria in Kenya are outlined in the 2011 Kenya Healthcare Service Model (KQM) [7] which provides the conceptual framework for quality improvement in Health Care in Kenya. The KQM integrates evidence-based medicine through wide dissemination of public health and clinical standards and guidelines with total quality management (TQM) [7].

The dimensions of healthcare service quality that impact on Kenyan Quality Model include the hospital environment that patient and healthcare workers interacts with constantly during service delivery, service improvement processes to deliver healthcare services and use patient feedback to improve on service offering, organization and management structures to support service delivery process such as provision of leadership and allocation of available resources [8].

Mission hospitals in Kenya owns approximately 13% health infrastructure, and provides services to over 30% of the over 40 million population in Kenya [9].

Mission and private healthcare sector together operates 43 percent of health infrastructure in Kenya [6,9]. Some of the mission hospitals in Kenya such as Mater Hospital in Nairobi County, PCEA Kikuyu, Kijabe and Nazareth hospitals have specialized and unique services such as neurosurgical clinics, cancer treatments, community neonatal programs, multiple educational programs and staffing exchange programmes (such as expatriates) which enables them to attract patients from all over the country.

In Kenya, mission hospitals accounts for 27.3% of NHIF accredited facilities [9] which requires them to remain competitive with other sectors by providing quality affordable services.

Since some of the mission hospitals are recognized as referral providers of healthcare services in Kenya, the hospitals have instituted measures to ensure services meet the national healthcare sector requirements.

Stakeholders who include clients have labeled praises and pointed out challenges facing the private sector such as perceptions of poor regulation of their practices [10], employment of unqualified health professionals [11], gaps in monitoring quality of care resulting and licensing challenges [6,12].

Healthcare workers that understand both the service delivery processes and the outcomes of services from patients' satisfaction feedback can provide valuable feedback on service quality perceptions on those specific processes that influence quality healthcare services that can be useful to management teams.

Nurses form the largest pool of hospital workers interacting constantly directly with patients and all other healthcare workers. They form a critical component of healthcare workers towards achieving quality objectives and hence quality healthcare service outcomes such as patient satisfaction. This means that their views, opinions and perceptions are crucial in understanding and improving quality of healthcare services. It is on this basis that this study sought to achieve three main objectives;

[1] To determine the perceived quality of healthcare services among nurses in mission hospitals and [2]

To establish nurses' perception of the quality of healthcare service processes in mission hospitals and [3]



To determine the influence of healthcare service processes on perceived quality of service among nurses in mission hospitals.

## Methodology

This was a cross-sectional study design. The study was conducted in Kiambu County, which is one of the 47 counties of Kenya. The doctor/population ratio in the county is 1:17,000 and the nurse/population ratio stands at 1:1,300. The average distance to the health facility in the county is seven (7) KM. There is a total of 17 Mission Hospitals in Kiambu County.

## The Study Population

Comprising 188 nurses drawn from Kijabe and Nazareth hospitals. The two are mission referral hospitals in Kenya providing comprehensive and even specialized services to a large population.

The study respondents, nurses, had at least 12 months working experience in their respective hospital. A pre - tested survey questionnaire was used to collect data among mission hospital nurses in Kenya from April to August, 2016.

## Quality of Service

Perceived quality of service was measured using nurses' perception index derived from the four (4) quality dimension of the **KQHM** [7]

Namely: - Perceived quality of physical infrastructure,

- Service processes,
- Management structures and
- Treatment services.

The perception was based on a *Likert scale* of *1-5* where 1 meant strongly disagree and 5 meant strongly agree.

## **Sampling**

Simple random sampling was used to select the nurses who participated in the study. Using Microsoft excel, a list of all nurses in each hospital was compiled separately for each hospital. The excel sheet was used to randomly sample and interview 188 respondents proportionate to number of nurses in each facility enlisted; 142 nurses from Kijabe Hospital and 46 nurses from Nazareth Hospital.

A pre-tested questionnaire was used to collect data from the sampled nurses. A total of 20 key in-depth interviews and two focus group discussions (FGDs)

were also conducted using pre-tested interview and FGD guide to generate more insight on the study.

Key informants included top management of the hospital and the heads of departments. FGD participants comprised nurses drawn from the hospitals. Each FGD comprised 8 participants. Two FGDs were conducted in each of the two sampled hospitals.

Pre-analysis of the quantitative data was done to check for inconsistencies, incorrect and missing data during field data collection and management for quality assurance. Data was first compiled, coded and entered into SPSS Version 20 for cleaning and analysis.

Descriptive statistics comprising frequencies and percentages was used to describe the perceived quality of services and establish nurses' perceptions on service delivery processes in the hospital. Linear regression analysis was used to establish the influence of the study variables on perceived quality of services.

In this study, statistical significance (P-value) was set at 0.05.

Qualitative data was coded and entered into Nvivo software, v11 for thematic analysis. A hybrid coding technique, comprising preset and open theme (emerging themes), was used to code the data.

Ideas, concepts, meanings, actions and relationships which came up in the data were coded as emerging themes.

The coded themes were used to explore relationships between themes, summarize ideas and identify emerging concepts, ideas and patterns within the data. The findings were integrated with quantitative findings.

The study had an ethical review approval from Kenyatta University Ethical Review Board and a research permit obtained from relevant institutions to conduct the study.

Unique codes were used to identify respondents of study instruments and enhance confidentiality of data collected.

## **Findings**

# Background Characteristics of Respondents

The study was conducted among 188 nurses drawn from mission hospitals (Table 1). In regards to age, 62% of the respondents were aged between 20-30 years.



Table 1 Background Characteristics of the Respondents

Characteristic		Frequency; n=188	Percent %
Age			
	20-30 years	116	62
	31-40 years	46	24
	41-50 years	17	9
	Over 50 years	4	2
	Non-Response	5	3
Marital Status			•
	Married	84	45
	Single	102	54
	Non-Response	2	1
Cadre			
	Enrolled Nurse	3	2
	Registered Nurse	158	84
	Degree holders	16	9
	Non-Response	11	6
Highest Education I	Level		•
	Certificate	3	2
	Diploma	152	81
	Higher Diploma	10	5
	Degree	19	10
	Non-response	4	2
Work Experience			'
	Less than 1 years	49	26
	1-2 years	50	27
	2-5 years	34	18
	5-10 years	24	13
	More than 10 years	31	16
Hospital	1		
	AIC Kijabe Hospital	142	76
	Nazareth Hospital	46	24

In regards to highest education level, 81% of the respondents had diploma as the highest level of education. In regards to work experience, 27% of the

respondents had 1-2 year of work experience in their current work station. Among the respondents, 84% of the respondents were Kenya registered nurses.



## Perceived Healthcare Service Quality

Availability of essential medicines had the highest quality perception score of 4.21. Followed by availability of qualified staff to provide specialized services which had a quality perception score of 4.13.

Management commitment towards quality service improvement had the lowest quality perception score of 3.14. The overall perception on service quality was 3.62 (Table 2).

Table 2: Perceptions on Perceived Healthcare Service Quality

SERVICE DELIVERY ASPECT	PERCEPTION SCORE		
The hospital has adequate buildings for service delivery.	3.83		
The hospital is well equipped to offer high quality services	3.35		
Service charter timelines to serve patients are reasonable	3.21		
There exists good relationship between patients and staff	3.88		
There are effective quality improvements teams	3.55		
Management is committed to service quality improvement	3.14		
There is effective supervision for quality service delivery	3.20		
There are well qualified staff to provide specialized treatment	4.13		
Most essential drugs are available in the hospital pharmacy	4.21		
There is good ambulatory care for critically ill patients	3.66		
Perceived Healthcare Service Quality Index	3.62		

# **Nurses Perceptions on Quality of Service Process**

The three service delivery aspects with the highest quality perception score who were upholding

patients' rights were (4.044), involvement of staff in quality improvement were (3.913) and availability of standard operating procedures at the departmental level were (3.7112) *(Table 3)*.



 Table 3; Perceptions of Healthcare Service Processes

No.	SERVICE PROCESS ASPECTS	PERCEPTION SCORE	
1.	Standard operating procedures are available for each department / unit	3.7112	
2.	Service delivery process allows adequate time for interacting with patients	3.3333	
3.	There exists good relationship among staff and their seniors	3.3944	
4.	Patients' perspective and rights are observed and respected	4.0440	
5.	I have attended a training (s) focused on service quality improvement	3.3043	
6.	We do satisfaction surveys to help understand and respond to patient needs / preferences	3.1176	
7.	There are effective quality improvement teams	3.5455	
8.	Staff are involved in quality assessment and improvement activities	3.9130	
9.	There are efficient discharge procedures for inpatients	3.6201	
10.	There are periodic / regular health service quality reviews	3.3051	
	Quality of Healthcare service processes perception index	3.5187	

The least rated service delivery aspects were performance of patient satisfaction survey with an aim of understanding and responding to patient needs (3.1176), provision of training on service quality improvement (3.3043) and performance of health service quality reviews (3.3051). Overall, the perceived quality of services processes was 3.5187.

## Influence Of Healthcare Service Process Perceptions On Perceived Quality Of Service

**Table 4** presents the linear regression analysis results that were used to model the influence of service



process on perceived quality of services. The model was statistically significant (F=49.529, P=0.001).

 Table 4: Influence of healthcare service processes on perceived quality of service

VARIABLES	ВЕТА			95% CI for (β)	
	(β)	t	Sig	Lower	Upper
Standard operating procedures are available for each department/unit	.093	1.932	.055	002	.135
Service process allows adequate time for interacting with patients	.225	4.761	.001*	.084	.202
There exists good relationship among staff and their seniors	.170	3.550	.001*	.049	.171
I have attended a training (s) focused on service quality improvement	.095	1.985	.049*	.000	.100
We do satisfaction surveys to help understand and respond patient needs/preferences	.125	2.510	.013*	.017	.141
Patients' perspective and rights are observed and respected	.178	3.773	.001*	.057	.183
There are effective quality improvements teams	.550	12.556	.001*	.092	.127
There are periodic/regular health service quality reviews	.020	.465	.643	018	.028
There are efficient discharge procedures for inpatients	.238	3.474	.001*	.070	.254
(Constant)	1.278	8.306	.001*	.974	1.582

### \**P-value*=0.05

Allowing adequate time for patient-provider interaction has a significant association with perceived quality of services.

A unit increase in perceived duration of patientprovider interaction score was associated with 0.225 increase in perceived quality of service score (t=4.761, p=.000). Adequate patient interaction was reported to be crucial in obtaining appropriate information for evidence-based and quality patient care decisions. Nurses reported spending limited time interacting with patients. Limited number of staff with higher workload limited patient-provider interaction time was linked to limited patient-provider interaction.



The following verbatim statement from the interviews tallies with these findings;

"We are few staff compared to the high
number of patients which limits the length of time
you can spend with a patient.

We would want to spend more time with patients
to be able to gather adequate information
to make suitable decision for care,
but there is pressure of reducing patient waiting
time"-FGD discussant

Establishing good relationship between staff and their seniors had a significant association with perceived quality of service. A one unit increase in the score for staff-management relationship was associated with a 0.170 unit increase in perceived service quality score (t=3.550, p=.001).

Respondents agreed that teamwork in service delivery is important in providing comprehensive quality care. A culture of teamwork among staff was reported. However, relationship gaps were noted in areas of facilitative supervision and two-way communication. A quote from one of the interviewees explains:

"Staff works as a team.

There is support from all the levels of management but improvement is required.

There is need to encourage two way communication by improving and supporting horizontal and vertical communication with the facility." Facility in-charge

Attending trainings on service quality improvement had a significant association with perceived quality of services. One unit increase in attendance of service quality-related training opportunities score was associated with a 0.095 unit increase in perceived quality of service score (t=1.985, p=.049). Respondents highlighted the need for regular quality-related trainings as an aspect of continuous quality improvement.

However, in the hospitals, quality training opportunities for all staff were said to be limited. Awareness on quality improvement processes was reported to be low. This was said to result in asymmetrical information, demotivation and lack of unity of purpose for quality improvement initiatives across the departments.

The following verbatim statement highlights this results

"We are not given adequate opportunities to attend quality improvement trainings as junior staff.

We have informed the management of the need for continuous capacity building even within the facility but little has been done.

Trainings are important for effective team work especially in a large hospital like this one we work in."

FGD Discussant

Undertaking customer satisfaction surveys with an aim of improving customer services was associated with perceived service quality. A one unit increase in the perceived score of facility commitment in implementing customer satisfaction surveys was associated with 0.178 unit increase in perceived quality of service score (t=2.510, p=.013).

Respondents indicated existence of mechanism for collecting customer feedbacks and opinions but they were not effectively used to improve quality of care.

Service satisfactions surveys were done for formality with limited use in informing quality planning, control and assurance activities. Technical skills to collect, analyze and use survey results to inform decisions was reported to be lacking among the staff. The following statement underscores the result:

"Honestly, the facility collects customer feedback but they are not properly used to implement service delivery.

I cannot remember any formal customer survey done in the last three years except for the formalities of feedback and complaint records.

The facility lacks dedicated staff to undertake these tasks.

We need to improve this aspect for continual improvement."

Head of Department

Upholding and respecting patients' rights during service delivery had a significant association with perceived quality of services. A unit increase in perceived score for upholding patient rights was associated with 0.178 unit increase in perceived quality of service score (t=3.773, p=.000).



Respondents reported availability of clear policy, guidelines and culture of respecting patient's rights in health service delivery such as non-discrimination and rights to privacy and confidentiality. Staff reported high levels of adherence to professional ethical obligations in providing care and protecting patient rights. Upholding patient rights was reported to have enhanced the good reputation of the hospitals and trust of their clients.

Availability of effective quality improvement teams was significantly associated with service quality perception. A one unit increase in the score for availability of effective quality improvement teams was associated with 0.550 unit increase in service quality perception score (t=12.556, p=.000).

Respondents reported existence of quality improvement teams and circles in which staff are involved. The teams were said to have helped strengthen service systems and processes for high quality of care. However, the team members, who majorly comprised staff, were reported to lack adequate competencies and skills in quality improvement activities due to lack of responsive capacity building opportunities of members. The following verbatim statement stresses the finding:

"We have functional quality teams
for which I am a member.

However, at times, we are limited
by lack of some key competences especially when
dealing with complex quality issues.
The formation of teams in times
of certain needs is sometimes faced
with the challenge of commitment
from the team member who has other duties"FGD discussant

Performance of regular service quality reviews (t=.465, p=.643) was not statistically associated with perceived service quality. Respondents reported irregular quality audits which lack capacity and skills for undertaking comprehensive assessment and corrective actions.

Lack of adequate resources to support the processes and incentives for implementation of recommendations was said to affect effectiveness of the quality audits and reviews.

Providing efficient inpatient discharge procedures had a statistically significant association

with perceived quality of services. One unit increase in perceived efficiency of discharge procedure score was associated with 0.238 unit increase in the perceived quality of services score (t=3.474, p=.001). Respondents termed discharge procedures as fairly efficient.

They reported availability of proper and efficient discharge process which helped achieve optimal use of available beds and facilities. This was reported to enhance patient-based care by keeping staff workload at manageable levels. The following verbatim statement illustrates the result:

"We have good discharge processes
and responsible persons at
every department which works fairly well except in
instances of delayed payment.
Timely discharges have helped make use
of available beds, reduce staff workload
and improve resource use by ensuring
those in need of hospital care are served
in a responsive manner.
However, we need to ensure prompt
communication with patient's relatives
and interdepartmental coordination
to optimize outcomes"
FGD discussant

### Discussion

The perceived quality of health care services in mission hospitals among nurses is fair. The top management has embraced quality improvement initiatives which are at the center of sustained and improved quality service delivery within a dynamic environment.

The hospitals have successfully created a quality-conscious culture among staff Top management in healthcare organizations are important drivers of service quality initiatives and processes [5,14].

The management within the mission hospitals are perceived to be committed to service improvement processes and quality service delivery which are important components of healthcare service quality [1].

Experienced, knowledgeable and quality conscious managers are said to be able to understand a health systems approach in relation to customer needs and therefore dedicate resources to quality improvement processes.



Possessing the capability to implementation holistic and evidence based quality practices can have positive impact on healthcare service quality within the dynamic healthcare environment characterizing health care systems [15].

This requires ability to engage all levels of management and staff, using a team's approach, in setting up and implementing effective quality procedures and policies to respond to quality issues within the hospital. This aspect is poorly developed in mission hospitals.

The study noted lack of well-capacitated and empowered quality improvement teams to respond and address quality issues such as service efficiency, staff engagement, adoption of newer technologies and service processes and capacity building concerns.

Service delivery processes play a crucial role in translating care delivery inputs into positive health outcomes. Service delivery activities which relates to patient care such as staff involvement in quality improvement are important aspects of service which help foster positive staff perceptions towards service quality. According to *Bergman*, *et al.*, [16]

Responsive service delivery processes should take into account staff inputs by empowering and involving them in quality activities.

This study affirmed that improving interaction with patients, providing quality-related trainings and ability of facility to upholding patients' rights constitute key pillars for improving quality of health services. In a study by Pomey, *et al.*, [5]

It was reported that establishing and sustaining good client-provider relationships can improve patient treatment outcomes by improving adherence and building patient trust.

The length of patient consultations has attracted increasing debate and discussion on its role in improving patient outcomes and quality of care [10,14,17].

Increasing patient-provider contact, time is key in building relationship for patient-based care.

This requires engaging patients in an active process to understand their respective needs especially

in mission hospitals where patient expectations are higher compared to the public facilities.

To achieve this outcome, hiring of more qualified professionals, who are motivated to serve client needs, to reduce staff workload and patient waiting times is necessary. However, understanding causes of limited patient interactions can offer more long-lasting and cost-effective solutions [18,19].

Matching these initiatives to cost-benefits is important for continuity and sustainability of the quality initiatives and reforms. This will reduce patient disatisfaction and improve efficiency.

Mission hospitals have limited technical skills and capacity to collect and analyse real time hospital data for decision-making [13,20].

Management was found to focus more on clinical staffing and process than technical support services which are key in supporting provision of core services such as computerization of the information systems and staff training on quality improvement processes.

This has been linked to limited use of quality improvement tools and processes such as planning, use of satisfaction surveys, customer complaints and suggestions. High standard audits, for identifying and addressing sensitive problems in the hospitals.

Suprisingly, customer needs, priorities and preferences are not fully articulated, matched to resources and aligned to quality objectives in the hospitals.

Communication is at the heart of functional and performing health systems [21].

The hospitals have functional communication mechanisms for information sharing and management. However, there are gaps in their effectiveness due to lack of responsive upwards information flow. Staff engagement and empowerment requires effective two - way communication for meaningful engagement [20,22].

For instance, providing positive feedbacks and allowing positive criticism provides unique



opportunities for identifying training needs, service priorities and also client relationship building [23].

This allows innovative and creative organizational culture for improved ideas and solutions to the quality problems faced.

Good and supportive supervision has also been critical in creating empowered staff with abilities to discuss challenges they are experiencing [24] and even suggest possible solutions hence motivating them to utilize their skills towards patient-based.

According to **Hartgerink**, *et al.*, [25] service delivery efficiency is a key factor predicting customer satisfaction with quality of care, both patients and nurses. Timeliness of discharge procedures is imperative in ensuring a manageable number of patients, reduce over-crowding and allow provision of patient-based care [25,26].

Inefficient discharge procedures limit staff capacity to deliver passionate and patient tailored services to the most needy patients resulting to crowded wards.

A study by **Pomey**, *et al.*, [5] reported shorter hospital post-surgery stay to be an indicator of quality treatment and improved quality care and outcome.

Efficient processes allow optimal use of available resources such as beds, facilities and supplies. Proper communication and coordination of responsible departments based on respective SOPs has contributed to establishment and sustainability of efficient discharge processes.

Adherence to SOPs and policies provided useful framework through which quality standards were met and rights of patients were upheld in service delivery [14,23,26].

Adherence to SOPs gives positive feeling and assurance that the rights of patient's were respected. This is different from public hospitals in which nurses' were found to fail to cultivate trust, establish rapport, and ensure fairness in handling patient issues [27].

Quality improvement teams in the mission hospitals were inadequately functional and effective due to operational challenges related to lack of skills, top management good will and adequate resources such as lack of resources ranged from lack of quality audit tools.

Thriving of quality improvement teams requires a continuous quality improvement culture supported by top management leadership and acceptance of quality of care as the gold standard for facility reputation and service delivery philosophy [11].

Establishing poorly empowered teams in the hospitals was linked to non-compliance to quality standards and demotivation of the staff.

Quality improvement teams need to include champions of quality with a zeal for meeting quality standards and establishing a culture of high standards in the facility with self motivation to the require goals.

This requires the management support in prioritizing quality [1] and providing resources to meet the set standards [12,21] including designing quality-related capacity building programs, setting and enforcing standards and providing incentives for staff to meet the expectations.

### Conclusion

The nurses' perception of service quality in the mission hospitals is fair but there is a substantial room for improvement. To achieve a competitive edge in the market and address the gaps, mission hospitals should continue to consider quality as one of the top priorities.

The quality priorities should take into account various service delivery process aspects.
This include;

- (a.) The length of patient provider interaction
- (b.) Existence of effective teamwork
- (c.) Culture of upholding patients' rights
- (d.) Capacity to conducting quality assessments and uses the results
- (e.) Availability of effective quality improvements teams
- (f.) Implementation of efficient discharge procedures.

To succeed in quality improvement; the hospitals should engage visionary quality conscious leaders, capable of implementing quality improvement



initiatives using a system's approach. The leadership should be tasked with provision of opportunities for active staff engagement and capacity building to create a culture of quality in the organizations. Leaders who distance away fom destructive politics in their service.

This should be supported by establishment of effective and well-resourced quality improvement teams and opportunities for actionable staff feedback to help address identified gaps. To advance the value of this study, there is need for a study to understand and inform policy discussions on actual cost of quality improvement initiatives and its implication on access to services.

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## **Competing interest**

Authors declare they have no competing interest.

### **Authors Contribution**

All the authors participated in all the phases of the study which include conception of the study, protocol development, data collection, analysis and manuscript preparation

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