ASSESSMENT OF KNOWLEDGE ATTITUDE AND PRACTICE OF QUALITY ASSURANCE AMONGST NON-PHYSICIAN MEDICAL LABORATORY STAFF OF TERTIARY HOSPITALS IN NORTHERN NIGERIA: A CROSS-SECTIONAL STUDY

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ABSTRACT

Introduction: Quality assurance is essential in every health institution, particularly in a laboratory setting to achieve and maintain quality, reliable and dependable test results. Despite the reports of compliance in some laboratories in Nigeria, it suffers serious challenges. This study aims to assess the level of knowledge, attitude and practice of quality assurance among non-physician pathology laboratory staff of tertiary hospitals in northern Nigeria.

Methodology: This is a descriptive cross-sectional study among 103 non-physician medical laboratory staff working in different pathology laboratories in the study area. Mean values and proportions of Knowledge, attitude and practice was assessed using a self-administered questionnaire and was classified as good or poor using the modified Bloom's criteria. T-test and Chi-square were used to test level of significance in observations at 95% confidence level.

Results: 87.4% had good knowledge, 78.6% had good attitude and 73.5% had good practice of quality assurance in their health facilities. Mean score for practice was higher (4.64 ± 1.83), compared to knowledge (2.39 ± 0.69) and attitude (1.99 ± 0.72). Knowledge, attitude, and practice were associated with work experience and increased with it, while age of participants was only associated with practice (p=0.023). Highest level of knowledge, attitude and practice was observed in respondents with 21-30 years of working experience. Factors associated with good knowledge attitude and practice was Adherence to ISO, SON policies (p=0.002), regular training and re-training of personnel (p=0.001), regular accreditation by regulatory bodies (p=0.003), and higher working experience (p=0.023). The major challenge to practice of quality assurance was inadequate/lack of training of staff on quality assurance.

Conclusion: There is high level of knowledge, good attitude and practice of quality assurance among non-physician medical laboratory staff of tertiary hospitals in northern Nigeria. Similar studies is recommended in other region of the country.

Keywords: Quality assurance, Knowledge, Attitude, Practice

INTRODUCTION

Medical laboratories play a crucial role in healthcare by providing results that inform clinicians' diagnostic and therapeutic decisions. The reliability, accuracy, and timeliness of these results are paramount, as inaccuracies can lead to misdiagnoses, inappropriate clinical management, extended treatment durations, unnecessary resource expenditure, or even loss of life.¹ Assays carried out in laboratories primarily involve measuring biochemical parameters in clinical specimens.² As with any measurement process, these assays are susceptible to both random and systematic errors during the analytical phase. Variations in these errors across different laboratories can result in discrepancies in the numerical values of test results for identical parameters derived from the same clinical specimen.¹

Despite these inherent measurement errors, it is expected that results for the same parameter from identical samples across various laboratories should align within an acceptable margin of error, regardless of the analytical methods employed. It is essential for results from different laboratories to be comparable and consistent, leading to uniform clinical decisions regarding diagnosis and treatment. Only when these conditions are met can there be a reasonable interdependence of laboratory results on a global scale. The introduction of quality management principles by the International Organization for Standardization (ISO) aims to standardize laboratory practices and enhance the comparability of results across laboratories. Achieving this goal requires minimizing measurement errors by standardizing every step of the analytical process, from specimen collection to result reporting and interpretation.³ In practice, however, significant discrepancies between numerical results from different laboratories can lead to varying diagnostic and therapeutic decisions. These differences often stem from errors at various stages of the testing process. Pre-analytical errors such as patient preparation, sample collection, proper sample container usage, transportation methods, and sample storage

account for approximately 70% of inaccuracies in laboratory results.⁴

Analytical errors can be mitigated through adherence to Standard Operating Procedures (SOPs), utilization of high-quality reagents and control materials, ensuring the operational efficiency of analytical equipment, and maintaining regular calibration protocols. Additional sources of analytical errors may include unfavorable working conditions like inadequate air conditioning, inconsistent electricity supply, and poor laboratory ergonomics. Furthermore, postanalytical phases involving verification, transcription, interpretation, and reporting of results are also common error sources. To minimize these inherent errors across laboratories globally, all processes within the laboratory analytical value chain must be standardized. The ISO 15189 defines quality as a set of characteristics of a service or production, which provide the customer's requirement and articulate this need by outlining twelve quality management essentials for medical laboratory practice that provide high quality service to clinicians by producing accurate, precise, relevant and comprehensive data that can be useful for management of patients.¹

To ensure compliance with these established standards, medical laboratories undergo periodic audits and accreditation by recognized agencies worldwide. This accreditation process is essential for licensing laboratories to conduct analyses on clinical specimens and is a standard practice in many developed nations as well as some developing regions. Accreditation serves as a quality assurance (QA) mechanism that guarantees certified laboratories produce reliable and highquality results, fostering interdependence between laboratory outputs. Unfortunately, many developing countries including Nigeria face challenges in implementing the twelve quality management essentials due to insufficient resources such as infrastructure, equipment maintenance, skilled personnel, financial support, and regulatory oversight. This lack of a robust policy framework undermines the delivery of quality medical laboratory services.⁵

As a result, many medical laboratories in developing countries particularly in sub-Saharan Africa are not subject to mandatory audits or accreditation for quality control and service delivery. Consequently, test results from these facilities may often lack accuracy and reliability. This situation makes it difficult to ensure comparability and interdependence among laboratory results in these regions. Given these challenges, this study aims to assess the knowledge, attitude, and practice (KAP) of QA among non-physician pathology laboratory staff in tertiary hospitals in Northern Nigeria. Understanding these factors is essential for establishing a baseline for future improvements in laboratory quality services.

MATERIALAND METHODS

Study Design: This is a descriptive cross-sectional study among 103 non-physician medical laboratory staff working in different selected pathology laboratories in Northern Nigeria.

Study Area: Study was carried out in Abubakar Tafawa Belewa University Teaching Hospital (ATBUTH) Bauchi, Jos University Teaching Hospital (JUTH), Federal Medical Centre Jalingo and Benue State University Teaching Hospital Makurdi, carried out in 2024 lasting for a period of three months (between March to May).

Study Population: Study was carried out among Medical Laboratory Scientists (MLSs), Medical Laboratory Assistants (MLAs) and Medical Laboratory Technologist (MLTs) working in different pathology laboratories in the study area.

Inclusion Criteria: All consenting medical laboratory staff that participate in part or in whole in Internal Quality Control in all the pathology laboratories working in different pathology laboratories in the study area.

Exclusion Criteria: All physician pathologists were excluded in these surveys. All non-laboratory staff such as attendants, administrative secretaries

and securities was also excluded in the study.

Sample size Determination

A census technique was used to sample the participants. Therefore, the questionnaires were distributed to 116 MLS working in the four pathology laboratories of all the Tertiary Hospitals as earlier mentioned. Out of the 116 questionnaires administered, 103 were recovered.

Data Tool and Collection: A structured questionnaires with closed ended questions to assess knowledge attitude and practice of QA was self-administered to study participants, comprising of 26 questions. 6 Sociodemographic characteristics, 5 on knowledge, 5 on attitude and 8 on practice. A pilot study was performed among 5 randomly selected laboratory technologists of pharmacology, Microbiology and Zoology laboratories of University of Jos to check the reliability and validity of the questionnaire and it was modified accordingly with a cronbach alpha value of 0.722. The questionnaire was made to assess knowledge attitude and practice of all the medical laboratory workers excluding medical doctors, administrative secretaries, securities and attendants about the concepts of QA in the preanalytical, analytical and post-analytical stages of the total testing process in medical laboratories. Their knowledge about the QA pertaining equipment and instrumentation, reagents, procedures, facilities, educational programs, specimen collection and transportation, safety, reporting and recording areas were also assessed.

Data management and analysis:

Knowledge, Attitude and Practice of QA: From the responses in the questionnaire, a scoring system was adapted using the modified Bloom's criteria with slight modification.⁶ Each correct response("Yes") was given a score of 1" and a wrong answer ("No") was given a score of 0." A mean score of responses was also computed to determine the overall knowledge, attitude and practice of QA among respondents and was also classified as either good or poor.⁶ Modified Bloom's cut off points was used to categorize knowledge, Attitude and Practice as good (50-100%) and poor (<50%).

Data Analysis: T-test was used to compare the mean score of knowledge, attitude and practice, while Chi-square test was used to test the association of knowledge, attitude and practice with years of experience and qualitative variables. All test was carried out at 95% confidence interval, statistical significance was considered at (p<0.05). Results were presented in contingency tables and charts. Analysis was done using SPSS version 26.0.

Ethical clearance: The study was approved by the Ethical Committee of Abubakar Tafawa Balewa University Teaching Hospital in Bauchi State with ref. Number ATBUTH/ADM/42/VOL.1. "Study participation was preceded by written informed consent of each participant; after a thorough explanation and clarification of study aims.

Participation in the study was voluntary; with confidentiality and anonymity of study participants assured."⁷

RESULTS

Table 1 (below) shows the sociodemographic characteristics of respondents in the study area, 103 respondents participated in the study. The highest age group was respondents who were 31-40 years (53.4%) while the least were respondents 50-60 years (3.9%). The mean age was 36 years. Sex distribution was in the ratio of 1:1. Respondents who were married were higher (72.8%), predominantly the respondents were Muslim (80.6%) and 91.3% were from Bauchi state. Respondents who had work experience from 1-5 years were more (35.9%) and least were those with 21-30 years of experience (5.8%). 1.9% of the total study population did not have at least one year of working experience. All respondents had tertiary level of education.

Variables	Response	Frequency	Percentage (%)
Age (years)	20-30	27	26.2
	31-40	55	53.4
	41-50	17	16.5
	50-60	4	3.9
	Mean age	36.48±7.21	
Sex	Male	54	52.4
	Female	49	47.6
	Sex ratio (M: F)	1:1	
Marital status	Married	75	72.8
	Single	24	23.3
	Widow/widower	4	3.9
Religion	Christianity	20	19.4
C	Muslim	83	80.6
State	Bauchi	94	91.3
	Benue	2	1.9
	Plateau	5	4.9
	Taraba	2	1.9
Work Experience	<1	2	1.9
(Years)	1-5	37	35.9
	6-10	26	25.5
	11-20	32	31.1
	21-30	6	5.8

Table 1: Sociodemographic characteristics of respondents

Table 2 (below) shows the Mean scores and proportions of Knowledge, attitude and practice of non-physician medical laboratory staff of tertiary hospitals in northern Nigeria. With respect to proportions, good knowledge was 87.4% compared to attitude (78.6%) and practice (73.5%).

Table 2: Knowledge, attitude and practice of quality assurance of non-physician medical laboratory staff of tertiary hospitals in northern Nigeria

Variables	$Mean \pm SD$	Ν	Good (%)	Poor (%)	
Knowledge	2.39±0.69	103	90(87.4)	13(12.6)	
Attitude	1.99 ± 0.72	103	81(78.6)	22(21.4)	
Practice	4.64 ± 1.83	103	75(73.5)	28(27.2)	

Table 3: So	ociodemographic	characteristics	associated	with goo	od knowledge,	attitude and
practice of	QA					

			Good KAP (%)		
Variables	Response	Ν	Knowledge	Attitude	Practice
Age (years)	20-30	27	22(81.5)	20(74.1)	24(92.3)
	31-40	55	51(92.7)	43(78.2)	40(72.7)
	41-50	17	13(76.5)	14(82.4)	9(52.9)
	50-60	4	4(100.0)	4(100)	2(50.0)
	Chi-square		4.690	1.568	9.569
	p-value		0.196	0.667	0.023*
Sex	Male	54	43(87.8)	37(75.5)	36(75.0)
	Female	49	47(87.0)	44(81.5)	39(72.2)
	Chi-square		0.012	0.545	0.022
	p-value		0.913	0.460	0.751
Marital status	Married	75	65(86.7)	60(80.0)	54(73.0)
	Single	24	21(87.5)	19(79.2)	19(79.2)
	Widow/widower	4	4(100.0)	2(50.0)	2(50.0)
	Chi-square		0.613	2.040	1.541
	p-value		0.736	0.361	0.463
Religion	Christianity	20	15(75.0)	14(70.0)	9(45.0)
	Muslim	83	75(90.4)	67(80.7)	66(80.5)
	Chi-square		3.448	1.103	10.403
	p-value		0.063	0.294	0.001*
Work Experience	None	2	2(100.0)	2(100.0)	1(50.0)
(vears)	1-5	37	31(83.8)	2(100.0) 28(75.5)	31(86.1)
(Jears)	6-10	26	30(93.8)	27(84.4)	17(53.1)
	11-20	32	5(83 3)	4(66 7)	5(83 3)
	21-30	6	22(84.6)	20(76.9)	21(80.8)
	Chi-square	v	6.169	4.921	11.338
	p-value		0.045*	0.047*	0.023*

Result is significant where p<0.05

Assessment of Knowledge Attitude And Practice of Quality Assurance Amongst Non-physician Medical Laboratory Staff

			Good KAP (%)		
Variables	Response	Ν	Knowledge	Attitude	Practice
Adherence to ISO, SON	No	47	40(85.1)	34(72.3)	27(58.7)
Policies	Yes	56	50(89.3)	47(83.9)	48(85.7)
	Chi Square		1.404	3.610	9.472
	p-value		0.524	0.050*	0.002*
Regular accreditation	No	11	5(45.5)	8(72.7)	4(36.4)
	Yes	92	85(92.4)	73(79.3)	71(78.0)
	Chi Square		19.627	0.256	8.750
	p-value		0.001*	0.613	0.003*
Regular Staff training and	No	25	16(64.0)	18(72.0)	20(80.0)
Development	Yes	78	74(94.9)	63(80.0)	55(71.4)
	Chi Square		16.361	0.867	0.712
	p-value		0.001*	0.352	0.399

Table 4: Some factors associated with good knowledge, attitude and practice (KAP) of QA

Result is significant where p<0.05



Fig 1: Challenges associated with practice of QA among non-physician medical laboratory staff of tertiary hospitals in northern Nigeria

DISCUSSION

The study has assessed the knowledge, attitude, and practice (KAP) of QA among non-physician medical laboratory staff in tertiary hospitals in Northern Nigeria. The results indicated that the majority of respondents were within the age group of 31-40 years (53.4%), with a mean age of 36 years. The sex distribution was balanced (1:1), and most respondents were married (72.8%), predominantly Muslim (80.6%), and from Bauchi State (91.3%). A significant proportion of respondents had work experience ranging from 1-5 years (35.9%), while only 5.8% had 21-30 years of experience. Notably, all participants held tertiarylevel education. The study revealed a significant difference in mean KAP scores: knowledge (2.39 ± 0.69) , attitude (1.99 ± 0.72) , and practice (4.64 ± 1.83) . A high percentage of respondents demonstrated good knowledge (87.4%), good attitude (78.6%), and good practice (73.5%)regarding QA in their health facilities.

The 87.4% knowledge level suggests that healthcare professionals are generally wellinformed on QA procedures. This result is consistent with earlier research that demonstrates comparable patterns in knowledge levels among respondents. Medical Technologists in Selected Level III Hospitals in Davao City hospitals reported 93% knowledge of QA among laboratory staff,⁸ while a study in Addis Ababa in the Department of Medical Laboratory Science found that 81.7% of nonphysician laboratory healthcare providers who had a strong understanding of QA.9 Similarly in another study Among Medical Laboratory Technologists Working in Laboratories of Lahore demonstrated 78% knowledge of QA.¹⁰ However, these findings contrasts sharply with a study in Nepal, which reported only 25% of non-physician laboratory scientists possessing inadequate knowledge on QA," another study in Nigeria also found gross deficiencies in the knowledge of QA and aspects of laboratory safety among Pathology Laboratories at the University of Port Harcourt Teaching Hospital, Nigeria.¹² The findings of this study underscore the significance of educational attainment and ongoing professional development in improving QA knowledge among

laboratory staff, and this disparity implies that local factors, including training opportunities and educational background, have a significant impact on knowledge levels.

The attitude score of 1.99 ± 0.72 reflects a generally positive disposition towards QA practices, with 78.6% of respondents displaying a favorable attitude. This aligns with findings from a study in Nigeria that report positive attitudes towards QA among healthcare workers,¹² similarly the study in Davo city shows a 67.5% good attitude towards QA among laboratory staff,⁸ Other studies, however, reported contrast finding with lower attitude towards QA, such as 45.1% that was reported in Ethiopia and 44% in Lahore.^{9,10}

With a practice score of 4.64 ± 1.83 , the vast majority of responders (73.5%) indicating high use competent QA procedures as well as compliance to accreditations and regulatory body policies. This high standard of practice is promising and has a favorable impact on the educational and training opportunities for laboratory employees in Northern Nigeria. In a study assessing medical laboratory professionals on IQC practices in Addis Ababa, it was found that while practice levels were high (81.7%), poor documentation practices were reported by 32% of participants who did not perform IQC.⁹

A study in Davo indicated that most respondents were compliant with QA practices, but specific percentages for compliance were not provided.⁸ In contrast, whereas some laboratory employees showed acceptable QA standard logistical issues frequently made adherence difficult. The study in Lahore however indicated only 2% to have practice QA; and about 66% had poor practice.¹⁰ This suggests that while knowledge and attitudes may be favorable, practical application can be significantly influenced by external factors. Factors associated to positive KAP in this study included educational attainment, work experience, participation in accreditation programs, and regular training initiatives. This shares similarities as the contributory factors responsible for good KAP noted in similar other studies.^{8,9,10}

Despite this good KAP report, this study was

limited in some aspect. Several potential biases could have influenced the study's findings. The reliance on self-reported questionnaires may have led to social desirability bias, where respondents provide answers, they believe are expected rather than their true practices or beliefs, the sample may not represent all non-physician laboratory staff across Northern Nigeria, as it was limited to specific tertiary hospitals and the cross-sectional nature of the study limits the ability to establish causal relationships between educational interventions and KAP outcomes. The high percentages of good KAP may reflect an optimistic view rather than a comprehensive understanding of QA systems. Comparisons with other studies indicate that while some findings align with previous research showing positive KAP outcomes linked to education and training, discrepancies exist such as the low knowledge level reported in Nepal.¹¹ This suggests that while local factors may enhance KAP in Northern Nigeria, broader systemic issues remain. The generalizability of this study's findings is limited by its specific context focusing on tertiary hospitals in Northern Nigeria and could probide a limited insight into Changes over time While some results may resonate with similar populations in comparable regions or settings, differences in healthcare infrastructure, cultural attitudes toward OA, and educational opportunities could affect the applicability of these findings elsewhere.

CONCLUSION

We found good KAP of QA among non-physician medical laboratory staff of tertiary hospitals in northern Nigeria, however, while this valuable insights into KAP regarding QA among laboratory staff in Northern Nigeria is provided, further research with larger and more diverse samples is needed to confirm these findings and explore underlying factors influencing KAP more comprehensively.

RECOMMENDATIONS

Regulatory bodies such as ISO, SON should ensure that all medical laboratories undergo regular accreditation processes to ensure compliance with quality standards and improve the reliability of laboratory results, also Hospital administration should implement regular and structured training programs focusing on QA practices which should include workshops, seminars, and hands-on training to reinforce knowledge and skills related to QA.

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