

Evaluation of Performance Quality of Workers in Medical Laboratories within the Health Sector under the Corona Pandemic in Al-Muthana Governorate/Iraq

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Abstract— Laboratory performance is a relative concept, but it is crucial in the whole testing process, as are quality and safety. The study aimed to assess the quality of performance of workers in medical laboratories within the health sector during the Corona pandemic.

Materials and Methods: This cross-sectional study was conducted at 3 hospitals, 19 PHCCs distributed in 5 sectors, and 1 Public Health Laboratory randomly selected (using a Multistage random sampling method) in Muthanna governorate. The period of study starts on 1 December 2021 – 31 March 2021.

Results: The study found that 77.0% of the participants had a moderate assessment score, followed by 20.4% having a good assessment score. At the same time, the lowest percentage (2.6%) of the employees have a poor assessment score.

Conclusions: The study finds that the overall evaluation of employees towards laboratory services is moderate and acceptable. Laboratory performance is a relative concept, but it is crucial in the whole testing process, as are quality and safety. The study aimed to assess the quality of performance of workers in medical laboratories within the health sector during the Corona pandemic.

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Results: The study found that 77.0% of the participants had a moderate assessment score, followed by 20.4% having a good assessment score. At the same time, the lowest percentage (2.6%) of the employees have a poor assessment score. **Conclusions:** The study finds that the overall evaluation of employees towards laboratory services is moderate and acceptable.

Keywords: Laboratory, Healthcare Workers, Covid 19, Performance

I. INTRODUCTION

During the coronavirus outbreak, healthcare workers (HCWs) represent a significant yet understudied population. HCWs on the frontlines of virus protection may face an elevated risk of severe acute respiratory syndrome coronavirus-2 infection due to close contact with highly infected patients and, in many situations, insufficient access to personal protective equipment (PPE) [1].

Laboratory staff, infectious disease specialists, and other appropriate administrators should be educated and skilled in using safety equipment and aseptic safety measures in all procedures. All cases of laboratory-acquired infections should be told to infection control staff. Personal protective equipment (PPE) creates a physical barrier between microbes and those wearing it. It protects by assisting in the prevention of microorganisms from spreading: contaminating hands, hair, and shoes, eyes, clothing being transmitted to other patients and staff [2].

In Iraq's Kirkuk city, Hamoudy (2021) [3] conducted a study on the extent of newly private clinical laboratories' commitment to quality standards, concluding that the private laboratories do not fully adhere to the dimensions of quality, and recommending that laboratory officials pay more attention to the culture of quality and that the Governorate Health Department activate the supervisory role to close laboratories in violation. The study aimed to assess the performance quality of workers in medical laboratories within the health sector during the Corona pandemic.

II. MATERIALS AND METHODS

STUDY DESIGN: This cross-sectional study was conducted at 3 hospitals, 19 PHCs distributed in 5

sectors, and 1 Public Health Laboratory randomly selected (using a Multistage random sampling method) in Muthanna governorate.

SETTING OF STUDY: This study was conducted in the Muthanna governorate. Which included 3 hospitals (Al-Hussain Hospital, Al-Maternity, and Children Hospital, and Al-Warkaa Hospital), 5 sectors (1st Samawa sector, 2nd Samawa sector, Al-Rumitha Sector, Al-Warkaa Sector, and Alkhudhr sector), and Public Health Laboratory. These Hospitals and sectors were located within the geographical location of the Muthanna governorate.

SAMPLING SIZE: The sample size for employees is 152, as shown below:

$$n = \frac{N \times P(1-P)}{[N - 1(D2 + Z2) + P(1-P)]}$$

Where:

N= The Study Population size (250

employees)

n = sample size (152 for employees).

Z= Confidence level at 95% (1.96)

p = Probability (0.50)

d = Error Proportion (0.05) [4].

SAMPLING TECHNIQUE:

The total number of health institutions in Muthanna Governorate is 9 sectors and hospitals, distributed as 5 primary health sectors, 3 hospitals, and 1 Public Health Laboratory. While health centers and hospitals were randomly chosen by multistage sampling technique from all institutions, 152 employees were randomly selected by a simple random sampling technique.

SCORING CRITERIA:

In Positive Phrases, the five-level scale was rated on a 5-point Likert-responsive scale scored as an agreed-upon score by assigning a score of (5) for "**Strongly agree or Excellent**," (4) for "**Agree or Very good**" score of (3) for "**Neutral or Good**," score of (2) for "**Disagree or Acceptable**," score of (1) for "**Strongly disagree or Bad**." In Negative Phrases, the five-level scale was rated on a 5-point Likert-responsive scale scored as an agreed-upon score by assigning a score of (1) for "**Strongly agree or Excellent**," (2) for "**Agree or Very good**" score of (3) for "**Neutral or Good**," score of (4) for "**Disagree or Acceptable**," score of (5) for "**Strongly disagree or Bad**." The questions regarding the assessment of the sub-domain" so the Minimum of mean Score= 1, Maximum of mean Score= 5, and the Median for mean Score = 3. A score of more than 75% was considered good (>4 MS), 50-75% was acceptable/moderate (3-4 MS), and less than 50% was taken as poor (<3 score). Regarding overall

The employees' assessment score was 25 questions, so the Minimum Score= 25, Maximum Score= 125, and Median Score = was 50. A score of more than 75% was considered good (>100 scores), 50-75% acceptable/Moderate (50-100 score), and less than 50% was taken as poor (<50 scores).

STATISTICAL ANALYSIS:

The data were analyzed by the statistical package available from SPSS-26. Data were shown in simple measures of frequency, percentage, mean, standard deviation, and range (minimum and maximum values). The Pearson Chi-square test (χ^2 -test) was used to determine the significance of the difference between different percentages (qualitative data). When the *P*-value ≤ 0.05 , statistical significance was considered.

III. RESULTS

In table (1), the results found that the highest percentage of the participants in the age group 30-39 years 58 (38.2%), followed by 20-29 years 45 (29.6%). Regarding gender, it sets a distinct male preponderance of 87 (57.2%). The results of this study indicate that 77.0% of the participants live in urban areas. Concerning Education level, the study showed that the highest percentage, 52.6%, of the participants held a bachelor's degree, while the lowest percentage, 0.7%, had a doctorate. In addition, the results found that the highest percentage, 53 (34.9%) of the staff, have experience of 1-5 years.

Table (1): The distribution of laboratory staff according to the demographic characteristics

| Characteristic | No. | Percent (%) |
|---|-----|-------------|
| Age per years | | |
| 20-29 | 45 | 29.6 |
| 30-39 | 58 | 38.2 |
| 40-49 | 19 | 12.5 |
| ≥ 50 | 30 | 19.7 |
| Gender | | |
| Male | 87 | 57.2 |
| Female | 65 | 42.8 |
| Residence | | |
| Urban | 117 | 77.0 |
| Rural | 35 | 23.0 |
| Education level | | |
| Diploma | 59 | 38.8 |
| BSc. | 80 | 52.6 |
| Higher Diploma | 4 | 2.6 |
| MSc | 8 | 5.3 |
| PhD | 1 | 0.7 |
| Specialists | | |
| Medical lab assistant | 58 | 38.2 |
| Medical technology | 26 | 17.1 |
| College of Science (Biology, Chemistry, etc.) | 67 | 44.1 |
| Physician | 1 | 0.7 |
| Years of experiences | | |
| 1-5 | 53 | 34.9 |
| 6-10 | 41 | 27.0 |
| 11-15 | 22 | 14.5 |
| 16-and more | 36 | 23.7 |

Figure (1) shows that 139 (91.4%) employees have training courses. In contrast, 13 (8.6%) have no training course.

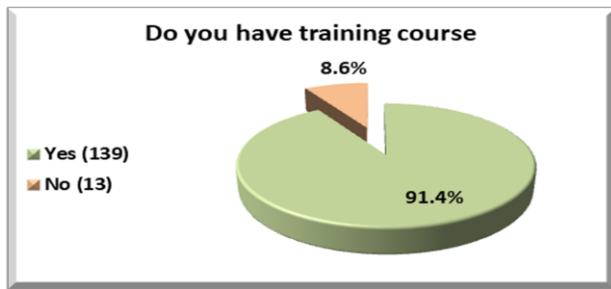


Figure (1) the distribution of the employees according to the training course

In table (2), the current study found that all indicators have an acceptable assessment score (mean score 3-4), except for the fifth question (What do you think of the adequacy of the preparation of personal protection methods?) have a good assessment score (4.05±0.88) with the answer rate 81.0%.

Table (2): The distribution of the employees according to a basic assessment of the laboratory

| | Bad No. (%) | Acceptable No. (%) | Good No. (%) | Very good No. (%) | Excellent No. (%) | Mean± SD | answer rate | Assessment |
|--|-------------|--------------------|--------------|-------------------|-------------------|------------------|--------------|-------------------|
| What do you think about the quality of the lab building? | 14 (9.2) | 37 (24.3) | 49 (32.2) | 38 (25.0) | 14 (9.2) | 3.01±1.11 | 60.2% | Acceptable |
| What do you think of the quality of drinking water in the laboratory? | 5 (3.3) | 50 (32.9) | 48 (31.6) | 37 (24.3) | 12 (7.9) | 3.01±1.01 | 60.2% | Acceptable |
| What do you think of the quality of sterilization in the laboratory? | 4 (2.6) | 22 (14.5) | 79 (52.0) | 31 (20.4) | 16 (10.5) | 3.22±0.91 | 64.4% | Acceptable |
| What do you think of the efficiency of the equipment used in the laboratory? | 1 (0.7) | 29 (19.1) | 62 (40.8) | 41 (27.0) | 19 (12.5) | 3.32±0.94 | 66.5% | Acceptable |
| What do you think of the adequacy of the preparation of personal protection methods? | 0 (0.0) | 6 (3.9) | 37 (24.3) | 52 (34.2) | 57 (37.5) | 4.05±0.88 | 81.0% | Good |
| What do you think of the quality of the furniture in the laboratory? | 2 (1.3) | 8 (5.3) | 29 (19.1) | 89 (58.6) | 24 (15.8) | 3.82±0.80 | 76.4% | Acceptable |
| What is your assessment of the laboratory in general? | 0 (0.0) | 2 (1.3) | 84 (55.3) | 53 (34.9) | 13 (8.6) | 3.51±0.67 | 70.2% | Acceptable |
| Overall Assessment | | | | | | 3.41±0.66 | 68.2% | Acceptable |

Mean (3), poor <50% (mean less than 3), Acceptable 50%-75% (mean 3-4), and Good >75% (mean more than 4).

Table (3) shows that all indicators regarding the evaluation of laboratory officers have an acceptable

assessment score (3-4 the mean score). While the mean overall assessment of the laboratory officers was 3.17±0.61, and the answer rate is 63.4%.

Table (3): The distribution of the employees according to the evaluation of the laboratory officer

| | Bad No. (%) | Acceptable No. (%) | Good No. (%) | Very good No. (%) | Excellent No. (%) | Mean± SD | Answer Rate | assessment |
|---|-------------|--------------------|--------------|-------------------|-------------------|------------------|--------------|-------------------|
| What do you think the official can do ineffective management (employee motivation, discipline at work, provision of under-equipment)? | 1 (0.7) | 25 (16.4) | 76 (50.0) | 37 (24.3) | 13 (8.6) | 3.24±0.85 | 64.8% | Acceptable |
| His ability to listen to employees' opinions in business development? | 5 (3.3) | 32 (21.1) | 77 (50.7) | 28 (18.4) | 10 (6.6) | 3.04±0.89 | 60.8% | Acceptable |
| Motivates staff to join training courses? | 1 (0.7) | 19 (12.5) | 80 (52.6) | 38 (25.0) | 14 (9.2) | 3.30±0.82 | 66.0% | Acceptable |
| Motivates the staff financially or morally? | 0 (0.0) | 0 (0.0) | 152 (100.0) | 0 (0.0) | 0 (0.0) | 3.00±0.00 | 60.0% | Acceptable |
| What is your assessment of the administrator in general? | 0 (0.0) | 15 (9.9) | 87 (57.2) | 37 (24.3) | 13 (8.6) | 3.32±0.76 | 66.4% | Acceptable |
| Overall Assessment | | | | | | 3.17±0.61 | 63.4% | Acceptable |

Mean (3), poor <50% (mean less than 3), Acceptable 50%-75% (mean 3-4), and Good >75% (mean more than 4).

All indicators of laboratory safety measures have a good assessment score (>4 mean score), except

for the 1st question, 2nd question, and 3rd question have an average assessment score (3-4 mean score). At the

same time, the overall assessment of laboratory safety measures has a good assessment score (4.12±0.43) and

an answer rate of 82.4% as shown in table (4).

Table (4): The distribution of the employees according to Laboratory safety measures

| | Strongly disagree No. (%) | Disagree No. (%) | Neutral No. (%) | Agree No. (%) | Strongly agree No. (%) | Mean± SD | Answer Rate | Assessment |
|--|---------------------------|------------------|-----------------|---------------|------------------------|-----------|-------------|-------------------------|
| I think working in the lab puts the employee at more risk than the rest of the employees in the organization | 0 (0.0) | 0 (0.0) | 25 (16.4) | 71 (46.7) | 56 (36.8) | 4.20±0.70 | 84.0% | Good/ strongly agree |
| As a laboratory professional, I have taken all the necessary measures to reduce my chances of contracting my diseases (viral liver, tuberculosis tests, COVID-19 vaccine). | 1 (0.7) | 18 (11.8) | 36 (23.7) | 57 (37.5) | 40 (26.3) | 3.77±0.99 | 75.4% | Moderate |
| Is there no need to bend, break or separate needles from the syringe before disposing of them? | 72 (47.4) | 66 (43.4) | 6 (3.9) | 5 (3.3) | 3 (2.0) | 4.31±0.85 | 86.2% | Good/ strongly disagree |
| Should all posters be provided to remind me of injury or tingling with acute instruments? | 2 (1.3) | 3 (2.0) | 45 (29.6) | 68 (44.7) | 34 (22.4) | 3.85±0.83 | 77.0% | Moderate |
| The necessity of preparing safety courses and teaching how to use the fire extinguisher? | 3 (2.0) | 29 (19.1) | 59 (38.8) | 60 (39.5) | 1 (0.7) | 4.17±0.80 | 83.4% | Good |
| Knowing how to use the water system in the laboratory (washing the tap before closing it?) | 2 (1.3) | 2 (1.3) | 55 (36.2) | 48 (31.6) | 45 (29.6) | 3.87±0.90 | 77.4% | Moderate |
| Do not leave the laboratory before ensuring the electrical equipment is turned off to avoid danger | 1 (0.7) | 0 (0.0) | 1 (0.7) | 36 (23.7) | 114 (75.0) | 4.72±0.54 | 94.4% | Good |
| Overall Assessment | | | | | | 4.12±0.43 | 82.4% | Good |

Mean (3), poor <50% (mean less than 3), moderate 50%-75% (mean 3-4), and Good > 75% (mean more than 4).

Table (5) shows that the overall assessment of COVID-19 measures has a good assessment score (4.02±0.43) with an answer rate of 80.4%.

Table (5): The distribution of the employees according to COVID-19 measures

| | Strongly disagree No. (%) | Disagree No. (%) | Neutral No. (%) | Agree No. (%) | Strongly agree No. (%) | Mean± SD | Answer Rate | Assessment |
|---|---------------------------|------------------|-----------------|---------------|------------------------|-----------|-------------|------------|
| Are you committed to wearing personal protective equipment (gloves and eyeglasses) to protect me? | 0 (0.0) | 3 (2.0) | 46 (30.3) | 47 (30.9) | 56 (36.8) | 4.03±0.86 | 80.6% | Good |
| What is the necessity of taking the COVID-19 vaccine? | 6 (3.9) | 7 (4.6) | 9 (5.9) | 47 (30.9) | 83 (54.6) | 4.28±1.03 | 85.6% | Good |
| Is there no need to emphasize sterilization before wearing the paws and after each patient? | 30 (19.7) | 50 (32.9) | 67 (44.1) | 3 (2.0) | 2 (1.3) | 3.68±0.85 | 73.6% | Moderate |
| Commitment to wearing a mask protects against infection with COVID-19 more than the paws? | 2 (1.3) | 33 (21.7) | 92 (60.5) | 15 (9.9) | 10 (6.6) | 3.01±0.79 | 60.2% | Moderate |
| I know how to dispose of personal protective equipment after work is completed. | 1 (0.7) | 9 (5.9) | 34 (22.4) | 54 (35.5) | 54 (35.5) | 3.99±0.93 | 79.8% | Moderate |
| Is there no importance for continuous sterilization of devices and employees during COVID-19? | 74 (48.7) | 68 (44.7) | 6 (3.9) | 2 (1.3) | 1 (0.7) | 4.40±0.69 | 88.0% | Good |
| Overall Assessment | | | | | | 4.02±0.43 | 80.4% | Good |

Mean (3), poor <50% (mean less than 3), moderate 50%-75% (mean 3-4), and Good >75% (mean more than 4).

Table (6) shows that there is no significant association between the overall assessment score of employees and demographic characteristics (P. value >0.05), except for age groups have a significant

association with the overall assessment score of employees at a significant level <0.05, age group 40-49 have a good assessment score.

Table (6): Association between the overall assessment score of employees and demographic characteristics

| | | | Overall score assessment of employees | | | X ² | P. value |
|--------------------------------------|---|-----|---------------------------------------|-------------------|-------------|----------------|---------------|
| | | | Poor (<75) | Moderate (75-100) | Good (>100) | | |
| Age | 20-29 | No. | 1 | 38 | 6 | 12.661 | 0.049* |
| | | % | 2.2% | 84.4% | 13.3% | | |
| | 30-39 | No. | 0 | 43 | 15 | | |
| | | % | 0.0% | 74.1% | 25.9% | | |
| | 40-49 | No. | 0 | 13 | 6 | | |
| | | % | 0.0% | 68.4% | 31.6% | | |
| | 50- and more | No. | 3 | 23 | 4 | | |
| | | % | 10.0% | 76.7% | 13.3% | | |
| Gender | male | No. | 2 | 70 | 15 | 1.399 | 0.497 |
| | | % | 2.3% | 80.5% | 17.2% | | |
| | female | No. | 2 | 47 | 16 | | |
| | | % | 3.1% | 72.3% | 24.6% | | |
| Residence | urban | No. | 4 | 85 | 28 | 5.547 | 0.062 |
| | | % | 3.4% | 72.6% | 23.9% | | |
| | rural | No. | 0 | 32 | 3 | | |
| | | % | 0.0% | 91.4% | 8.6% | | |
| Education level | diploma | No. | 2 | 44 | 13 | 1.141 | 0.997 |
| | | % | 3.4% | 74.6% | 22.0% | | |
| | B. sc. | No. | 2 | 63 | 15 | | |
| | | % | 2.5% | 78.8% | 18.8% | | |
| | Higher Diploma | No. | 0 | 3 | 1 | | |
| | | % | 0.0% | 75.0% | 25.0% | | |
| | M.SC | No. | 0 | 6 | 2 | | |
| | | % | 0.0% | 75.0% | 25.0% | | |
| | PhD | No. | 0 | 1 | 0 | | |
| | | % | 0.0% | 100.0% | 0.0% | | |
| Specialists | Medical lab assist | No. | 2 | 43 | 13 | 1.871 | 0.931 |
| | | % | 3.4% | 74.1% | 22.4% | | |
| | Medical technology | No. | 0 | 22 | 4 | | |
| | | % | 0.0% | 84.6% | 15.4% | | |
| | College of Science (Biology, chemistry, etc.) | No. | 2 | 51 | 14 | | |
| | | % | 3.0% | 76.1% | 20.9% | | |
| | Physician | No. | 0 | 1 | 0 | | |
| | | % | 0.0% | 100.0% | 0.0% | | |
| Years of experience | 1-5 | No. | 1 | 43 | 9 | 7.606 | 0.268 |
| | | % | 1.9% | 81.1% | 17.0% | | |
| | 6-10 | No. | 0 | 33 | 8 | | |
| | | % | 0.0% | 80.5% | 19.5% | | |
| | 11-15 | No. | 0 | 16 | 6 | | |
| | | % | 0.0% | 72.7% | 27.3% | | |
| | 16-and more | No. | 3 | 25 | 8 | | |
| | | % | 8.3% | 69.4% | 22.2% | | |
| Do you have a training course | yes | No. | 4 | 104 | 31 | 4.253 | 0.119 |
| | | % | 2.9% | 74.8% | 22.3% | | |
| | no | No. | 0 | 13 | 0 | | |
| | | % | 0.0% | 100.0% | 0.0% | | |

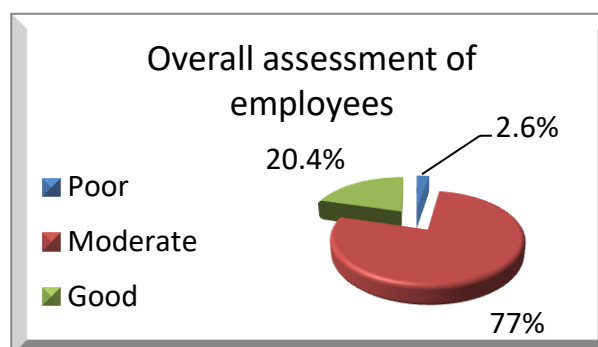


Figure (2): The distribution of the employees according to the overall assessment score

Figure (2) shows the overall assessment of the employees towards the laboratory services. The study found that the highest percentage, 77.0%, of the participants have a moderate assessment score, followed by 20.4% having a good score. At the same time, the lowest percentage (2.6%) of the employees have a poor assessment score.

IV. DISCUSSION:

The current study found that the highest percentage, 53 (34.9%) of the staff, have experience of 1-5 years. This result agreed with the study findings in Northwest Ethiopia developed by [5], who reported that most HCWs had experienced up to five years in health institutions. Also, this study shows that 139 (91.4%) employees have training courses. In contrast, 13 (8.6%) have no training course. These results are consistent with the study findings conducted in Al-Madinah city, Saudi Arabia [6], which found that the majority of the workers in the laboratory were trained in laboratory safety. Improving the retention of health professionals' training and specialist training courses has a positive impact on a range of important health indicators.

Regarding the quality of the lab building, the study found that the mean score of employees' answer was 3.01 ± 1.11 , which fall within the acceptable level with an answer rate of 60.2%. This result agreed with a previous study done in Iraq [7], which found that 66.6% of PHCs were acceptable for building the health center. Concerning the water quality in the laboratory, the study found that the mean score of employees' answer was 3.01 ± 1.11 , which fall within the acceptable level with an answer rate of 60.2%. This result disagreed with a previous study in Andhra Pradesh, India [8], which revealed that 100% of the participants indicated water supply in the laboratory room. The possible explanation may be due to some health institutions' lack of water filters.

Regarding the efficiency of the equipment used in the laboratory, the results report that the answer rate of 66.5% is acceptable. These results are consistent with [9], which found that most participants were somewhat satisfied with diagnostic tools and devices. As for the quality of sterilization, the results report that the mean score was 3.22 ± 0.91 and falls within the acceptable level. This result agreed with the study done in Wasit, Iraq [10], which found the same results.

The results of this study indicate that the mean overall assessment of the laboratory officers was 3.17 ± 0.61 , and the answer rate was 63.4%. These results are consistent with the previous study findings conducted in Babylon, Iraq [11], which found the same results. Concerning working in the lab putting the employee at more risk than the rest of the employees in the organization, the study shows that the mean score is 4.20 ± 0.70 with an answer rate of 84.0% (strongly agree). These results are consistent with a study conducted in In Iraq, AL-Amarah City Hospitals, which revealed the maximal effect of the biological hazards presented by AL-Sarraji *et al.* (2017) [12]. Also, These findings correspond with the previous

study in Nigeria, which found that the biological hazard level was high (95.5%) among the study participants [13]. These studies explained that direct contact with examination samples comprises risks to health [14].

The present study report that the mean score of question regarding (there is no need to emphasize sterilization before wearing the paws and after each patient) was 3.68 ± 0.85 and fell within the moderate level. These results are consistent with the study done by Wasit [10], which found that HCWs had a neutral level regarding sterilization before wearing the paws and after each patient.

In this study, there is no significant association between the overall assessment score of employees and demographic characteristics (P. value > 0.05), except for age groups have a significant association with the overall assessment score of employees at a significant level < 0.05 , age group 40-49 have a good assessment score. These results are consistent with the study findings conducted by [15], which found that there was no significant association between the level of satisfaction with the laboratory services and demographic characteristics (P. value > 0.05), except for age groups have a significant association with the level of satisfaction on the laboratory services at a significant level equal 0.06, also showed that HCWs in old age groups have a high satisfaction level. The possible explanation for a significant positive relationship in this advanced age may reflect the years of service, which in turn reflects the good performance of this age group in the health institution.

The study found that the highest percentage, 77.0%, of the participants have a moderate assessment score, followed by 20.4% having a good score. At the same time, the lowest percentage (2.6%) of the employees have a poor assessment score. These results agreed with the study findings by [16], who reported that most health service providers (80%) were satisfied with the laboratory services.

CONCLUSIONS AND RECOMMENDATIONS:

The study finds that the overall assessment of employees towards laboratory services is moderate and acceptable. The study recommends holding seminars and training courses for employees of health institutions, especially those who work in laboratories, on the risks arising from laboratory work and how to deal with them.

REFERENCES:

- [1] Z. Wu and J. M. McGoogan, "Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: summary of a report of 72 314 cases from the Chinese Center for Disease Control and Prevention," *JAMA*, vol. 323, no. 13, pp. 1239–1242, 2020.
- [2] H. C. Gugnani and H. S. Randhawa, "Laboratory-Acquired Fungal Infections, A

- Review," *Arch. Microbiol. Immunol.*, vol. 4, no. 02, pp. 51–56, 2020.
- [3] Hamoudy, "A study the extent of commitment of newly private clinical laborites in Kirkuk city with the quality standards," *J. Baghdad Coll. Econ. Sci. Univ.*, no. 65, pp. 207–225, 2021.
- [4] S. K. Thompson, "Sample size for estimating multinomial proportions," *Am. Stat.*, vol. 41, no. 1, pp. 42–46, 1987.
- [5] A. Muluken, G. Haimanot, and M. Mesafint, "Healthcare waste management practices among healthcare workers in healthcare facilities of Gondar town, Northwest Ethiopia," *Heal. Sci. J.*, vol. 7, no. 3, pp. 315–326, 2014.
- [6] O. F. Khabour, K. H. Al Ali, J. N. Aljuhani, M. A. Alrashedi, F. H. Alharbe, and A. Sanyowr, "Assessment of biosafety measures in clinical laboratories of Al-Madinah city, Saudi Arabia," *J. Infect. Dev. Ctries.*, vol. 12, no. 09, pp. 755–761, 2018.
- [7] Y. T. E. Mahasin A Altaha, "Assessment of the Quality of Primary Health Care Services in Al-Ramadi City, West of Iraq," *Al-Anbar Med. J.*, vol. 14, no. 1, pp. 1–14, 2017.
- [8] S. Sriram, "Availability of infrastructure and manpower for primary health centers in a district in Andhra Pradesh, India," *J. Fam. Med. Prim. care*, vol. 7, no. 6, pp. 1256–1262, 2018.
- [9] Z. A. Khairullah, B. A. Rashid, and R. S. Shwiehk, "Client Characteristics and Satisfaction with the Quality of Primary Health Care Centers Services in Babylon Governorate, Iraq," *Read write*, vol. 31, pp. 6–7, 2021.
- [10] N. Almayahi, A. Jasim, and S. H. Alibraheem, "Occupational Risk Assessment in Light of the Corona Pandemic in Some Health Institutions of Wasit Governorate-Iraq," *Ann. Rom. Soc. Cell Biol.*, vol. 25, no. 6, pp. 9748–9858, 2021.
- [11] Q. A. Kareem and S. M. Alalawe, "Evaluating the Quality of Primary Health Care Services in Babylon Governorate , Iraq," *Ann. Trop. Med. Public Heal.*, vol. 23, no. 9, pp. 1–12, 2020.
- [12] S. S. S. AL-Sarraji, H. J. Hassan, and B. M. Flaih, "Assessment of occupational hazards on nurses who working in the operative room at AL-Amarah City Hospitals," *kufa J. Nurs. Sci.*, vol. 7, no. 2, pp. 1–9, 2017.
- [13] M. O. A. Seidat Moyosore Ogunnaike, "Occupational hazard preventive measures among nurses in a Nigerian tertiary health institution," *Nurs. Care Open Access J.*, vol. 7, no. 1, pp. 20–25, 2020.
- [14] B. W. Osungbemi, O. A. Adejumo, A. A. Akinbodewa, and A. A. Adelosoye, "Assessment of occupational health safety and hazard among government health workers in Ondo City, Southwest Nigeria," *J. Adv. Med. Med. Res.*, vol. 13, no. 8, pp. 1–8, 2016.
- [15] A. G. Yeshanew, R. A. Geremew, and M. K. Temesgen, "Assessments of patient and health care workers satisfaction on the laboratory services in St. Paul's hospital millennium medical college, Addis Ababa, Ethiopia," *Int. J.*, vol. 3, no. 7, p. 192, 2017.
- [16] Z. Teklemariam, A. Mekonnen, H. Kedir, and G. Kabew, "Clients and clinician satisfaction with laboratory services at selected government hospitals in eastern Ethiopia," *BMC Res. Notes*, vol. 6, no. 1, pp. 1–7, 2013.