The knowledge-practice gap among critical care nurses regarding intra-abdominal pressure measurement

Nesma Hamdy Mahmoud[1], Mahmoud Thabet Ayoub[2] & Ghada Shalaby khalaf Mahran[3]

[1] Teacher at the Technical Secondary School of Nursing for Girls in Assuit Directorate of Health, Assiut Governorate, Egypt.

[2] Assistant Professor of General and Oncological Surgery, Faculty of Medicine, Assiut University, Egypt.

[3] Assistant Professor of Critical Care and Emergency Nursing Department, Faculty of Nursing, Assiut University, Egypt.

Abstract:
Background: Critically ill patients are prone to life-threatening conditions, including intra-abdominal hypertension and abdominal compartment syndrome. These complications require prompt diagnosis and intervention, as elevated intra-abdominal pressure can lead to compromised organ perfusion and failure. **Aim:** Assess the gap between nurses' knowledge and practices regarding intra-abdominal pressure measurement. **Research design:** A cross-sectional survey research design was adopted for this study. **Sample:** A cross-sectional study was conducted among 64 nurses working in Assiut University Hospital's intensive care units. **Setting:** The research was conducted in intensive care units of Assiut University Hospital including trauma care and general care, critical care, anesthesia care and surgical care units. **Tools:** Data was gathered using two tools: Nurses' knowledge assessment questionnaire comprising 20 multiple-choice questions, and an observational checklist to evaluate nurses' practices regarding intra-abdominal pressure measurement. **Results:** The study revealed that 39.1% of nurses had very low knowledge, while 81.3% exhibited unsatisfactory practices in intra-abdominal pressure measurement. A strong positive correlation (R=0.804, p<0.001) was observed between knowledge and practice. **Conclusions:** The majority of nurses had a poor knowledge and fall into the "unsatisfactory practice" category regarding intra-abdominal pressure measurement, intra-abdominal hypertension and abdominal compartment syndrome percentage of (81.8%), so it is essential to construct a continuous instructional program for nurses. **Recommendations:**Develop educational programs that emphasize the importance of accurate intra-abdominal pressure measurement.

Introduction:

Patients in critical care are particularly vulnerable to life-threatening health conditions, and those with more severe illnesses demand heightened and continuous nursing care. Nurses play a crucial role in this environment, relying on their knowledge, quick decision-making, and analytical skills to assess and manage patients with deteriorating conditions. They blend technical skills with theoretical understanding to provide high-quality care (**Smit & Zijlstra et al., 2022**).

Intra-abdominal hypertension (IAH) and abdominal compartment syndrome (ACS) are increasingly recognized as serious complications in critically ill patients, necessitating prompt diagnosis and intervention. Elevated intra-abdominal pressure (IAP) beyond normal ranges can compromise organ perfusion, potentially leading to organ failure. While critical care nurses are tasked with measuring and reporting IAP, there is a lack of specific literature addressing their knowledge of IAH and ACS (**Smit & Meurs et al., 2021**).

IAP refers to the pressure inside the abdominal cavity, normally ranging from 0 to 5 mmHg. IAH is defined when IAP reaches 12 mmHg or more, while ACS occurs when IAP exceeds 20 mmHg, often with abdominal perfusion pressures below 60 mmHg (**Allen & Sarani, et al 2020**). ACS is typically diagnosed in the ICU by measuring IAP through a bladder catheter in patients undergoing massive resuscitation who show signs of deteriorating kidney function, increased airway pressure on mechanical ventilation, abdominal swelling, and persistent low blood pressure (**Gottlieb & Koyfman et al., 2020**).

Several factors contribute to IAH and ACS, including bowel swelling, fluid overload, blood accumulation, and post-surgical abdominal packing. Normal IAP is below 5 mmHg in healthy adults, but conditions like obesity may increase it to 10-15 mmHg, while critically ill patients typically exhibit IAP levels between 5 and 7 mmHg. Bladder pressure, used to estimate IAP, should be measured with no more than 10-15 ml of fluid in the bladder. Increased IAP also affects blood flow through the inferior vena cava, which can be observed as a reduction in femoral vein blood flow (**Smit & Zijlstra et al., 2022; Kahana & Einav et al., 2022**). Advanced nursing practices allow experienced nurses greater responsibility and

autonomy in recognizing and managing IAH and ACS (Makic et al., 2021).

Significance of the study:

A study conducted by the World Society of Abdominal Compartment Syndrome in Australia found that fewer than 20% of critical care nurses could recognize less common causes of IAH. Nearly half of the respondents identified a lack of knowledge regarding IAP monitoring as a key challenge (**Rajasurya et al., 2020).**

A study from Helwan University emphasized the insufficient knowledge among nurses, with many unable to identify critical IAH risks such as massive fluid resuscitation, sepsis, or peritonitis. The study recommended implementing regular training programs to improve the quality of care for critically ill patients **Omnia et al. (2022).** Although there are many patients in the ICUs in risk for IAH, the researcher identifies most Assiut university units, and found that nurses did not receive any training or awareness regarding IAP measurements or its consequences. Therefore, the researchers want to conduct this study.

Aim of the study:

This study aimed to assess the knowledge-practice gap among critical care nurses regarding intra-abdominal pressure measurement.

Research questions:

▪ What is the level of nurses' knowledge about intra-abdominal pressure measurement?
▪ What is the level of nurses' practice about intra-abdominal pressure measurement?

Subjects and Methods:

The study was organized into four key design aspects: technical, operational, administrative, and statistical.

A convenience sample of 64 male and female nurses, representing all nurses working in the intensive care units at Assiut University Hospital (Intensive trauma care and general care, critical care anesthesia care and surgical care), voluntarily participated in voluntarily in the study.

Research design:

A cross-sectional survey design was employed to carry out this study.

Setting:

This research was conducted in the intensive care units of Assiut University Hospital encompassing trauma care (9 beds), general care (13 beds), critical care (22 beds), anesthesia care (16 beds) and surgical care unit (12 beds).

Inclusion criteria:

▪ Nurses provide direct & indirect patient care at emergency departments.

▪ Nurses who have at least one year of experience in emergency departments.

Exclusion criteria:

▪ Newly Graduated nurses with less than one year of experience in emergency departments.

Data collections:

Two main tools were utilized for data collection:

Tool: Nurses' Knowledge Assessment Questionnaire:

This tool adapted from **(Wise et al 2019)**, created by the researcher, to created by the researcher, to evaluate the knowledge level of emergency nurses concerning intra-abdominal pressure (IAP). It consisted of two sections:

Section 1: socio-demographic information:

Included five Items about personal information such as gender, age, years of work experience, job location and educational background.

Section 2: Nurses' knowledge of intra-abdominal pressure (IAP):

Included 20 multiple choice questions on nurses' knowledge about IAH. This was included (Definition of IAH, manifestation of IAH, causes, risk factors, prevention and management of Complications).

Scoring system

A scoring system was provided within the study to help the interpretation of study results. The possible score was ranked in percentage (out of 100%). Scores was divided into the following based on the nurse's percentage score in study tool that reflect the nurse's Knowledge of the IAP: very low knowledge (Less than 50%), Low Knowledge (50-59%), Satisfactory knowledge (60-69%), good Knowledge (70-95%), and Very good Knowledge (95-100**%).(Kirkpatrick et al 2013) & (Wise et al 2019)**.

Tool II: observational checklist:

This checklist Included 15 steps, adapted from **(Tayebi et al., 2021)** was based on a detailed review of current and relevant literature, designed to evaluate nurses' practice in measuring intra-abdominal pressure, as the following:

Part (1): Before the procedure: It included 5 items related to:

▪ Nurse preparation.
▪ Equipment preparation.
▪ Patient preparation.

Part (2): During the procedure: It included 8 items related to: adjusting the transducer, Clamping the drainage tube, cleaning sampling port, filling syringe with 25 ml solution of normal saline and injecting it in to the bladder, waiting for 30 to 60 seconds for equilibrium to occur, opening the clamp to let the saline solution flow past the clamp, and finally getting the mean intra-abdominal pressure reading at the end of expiration.

Part (3): Post the procedure: It included 2 items: Once a reading has been obtained, unclamp the

urinary drainage system, the pressure monitoring system may be left connected or disconnected and capped to maintain sterility of the system, Recording the bladder pressure on the patient flow sheet and remembering to subtract the 25 ml of instilled saline solution from hourly urine output.

Score system:
Responses were scored based on the following:
▪ Correct and complete = 2
▪ Incorrect =1
▪ Not performed or don't know =0

The total scores were converted into percentage: satisfactory more than 60%, and below this level was considered unsatisfactory. **(Kirkpatrick et al., 2013) (Tayebi et al, .2021).**

Administrative design:
Approval for conducting the study was secured from the Dean of the Nursing Faculty at Assiut University and the director of the emergency department at Assiut University Hospital after clarifying the objectives and purpose of the research. The tools used for this study were developed by the researcher after a comprehensive review of related literature.

Ethical considerations:
1. The research proposal was approved by the Ethical Committee at the Faculty of Nursing, Assiut University.
2. There were no risks to nurses who participated in the study.
3. Verbal consent was obtained from the participants.
4. Nurses were given the option to withdraw from the study at any time without providing reasons.
5. Participants' confidentiality and anonymity were strictly maintained.
6. The privacy of the study participants was ensured during data collection.
7. The study followed common ethical principles in clinical research.

Validity:
The tools used in the study were reviewed by seven experts from the Faculty of Nursing and the Faculty of Medicine at Assiut University to ensure content and face validity. The content validity index was 0.80, while the face validity index was 1.0.

Reliability:
The reliability of the tools was tested using Cronbach's alpha, which was found to be 0.75. This figure indicates a satisfactory level of internal consistency for the instruments, confirmed through analyses using SPSS software.

Phases of the Study:
The research was carried out in three primary phases: preparatory phase, pilot study, and fieldwork.

Preparatory Phase:
During this phase, the researcher conducted a comprehensive review of existing literature at both local and international levels, utilizing textbooks, academic articles, and reputable journals. The study tools were formulated based on this literature and subsequently validated by experts from the Critical Care and Emergency Nursing department at Assiut University.

Pilot study:
A preliminary pilot study was executed involving 10% of the participant sample (six nurses) to assess the validity and reliability of the research tools. The findings indicated no significant need for alterations, allowing those who participated in the pilot to also be included in the main study.

Fieldwork / Procedures:
▪ Data collection spanned approximately six months, commencing in October 2023 and concluding in March 2024.
▪ Prior to starting, the researcher secured formal approval from the Faculty of Nursing at Assiut University and explained the study's aims to the directors of the selected settings.
▪ The data collection process was conducted in accordance with ethical research principles, with assurances given to participating nurses that their information would be used exclusively for research purposes.
▪ The questionnaire was translated into Arabic to ensure comprehension, and the study's nature and objectives were thoroughly communicated to all participants, who were invited to ask questions for clarification.
▪ To ensure thoroughness, participants were instructed to respond to all questions. The data collection was conducted under the researcher's supervision and involved two key phases:

- **Phase 1:** Participants completed the nurses' knowledge assessment questionnaire (Tool I), which consisted of twenty multiple-choice questions designed to evaluate their understanding of intra-abdominal pressure (IAP), intra-abdominal hypertension (IAH), and abdominal compartment syndrome (ACS). The questions covered definitions, clinical indicators, risk factors, and preventative measures.

- **Phase 2:** Structured interviews were held with groups of 4-6 nurses to further elucidate their responses and enhance understanding of their choices. The researcher documented insights during these sessions for subsequent analysis.

▪ Additionally, the researcher observed each nurse while they measured intra-abdominal pressure, utilizing an observation checklist (Tool II) to evaluate their practical skills. Observations were conducted throughout various shifts, including both morning and afternoon.
▪ Data collection was carried out two days per week, supervised by the investigator.

Statistical design:

Data were analyzed using SPSS (version 26), and results were organized based on thematic analysis. Coding and clustering were performed to identify patterns in knowledge and practice.

Result

Table (1): Shows the frequency distribution of the study sample related to the sociodemographic data (N=64)

Variable		N=64	Percent
Gander:	Male	20	31.25
	Female	44	68.75
Age(M&SD)		28.4219	3.89059
Educational level	**Diploma nursing degree**	7	10.9%
	Technical Institute of Nursing	45	70.3%
	Bachelor nursing degree	12	18.8%
Experience	**0–2 years**	17	26.6%
	>2–5 years	22	34.4%
	>5–10 years	15	23.4%
	>10 years	10	15.6%
ICU	**Trauma intensive care unit**	10	15.6%
	General intensive care unit	13	20.3%
	Post-operative intensive care unit	6	9.4%
	Coronary ICU	18	28.1%
	Hepatic ICU	17	26.6%

Table (2): Frequency distribution of Total nurse's knowledge score categories (N=64)

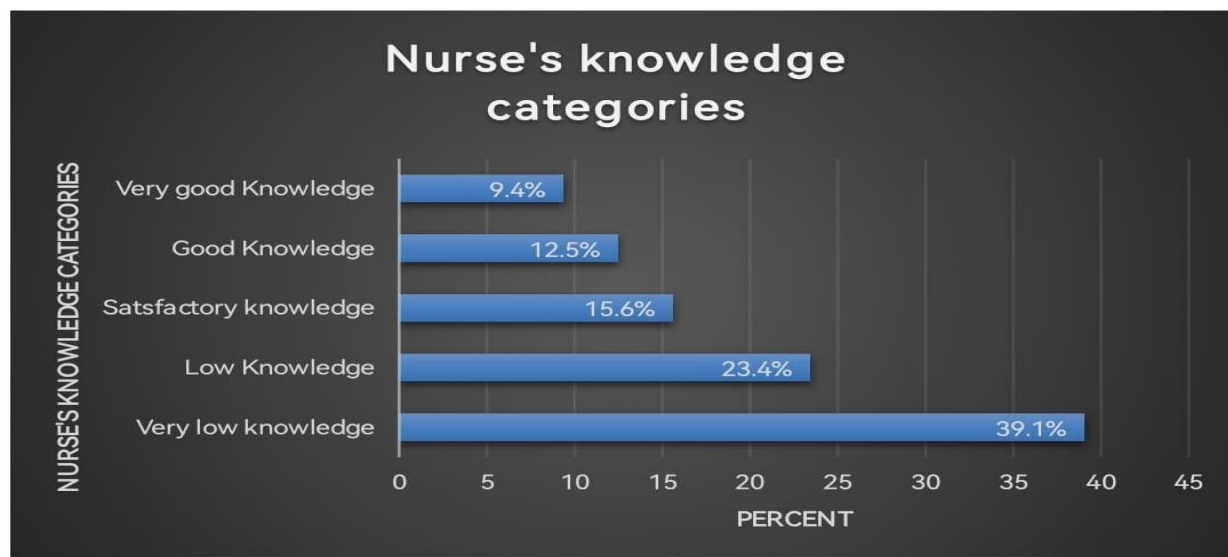| Variable		N=64	Percent
Total nurse's knowledge score (M&SD)		24.2031	5.74920
Nurse's knowledge categories	Very low knowledge	25	39.1%
	Low knowledge	15	23.4%
	Satisfactory knowledge	10	15.6%
	Good knowledge	8	12.5%
	Very good knowledge	6	9.4%

Figure (1): Percentage distribution of nurses' knowledge score categories (N =64)

Table (3): Frequency distribution of the total practice score categories N=64

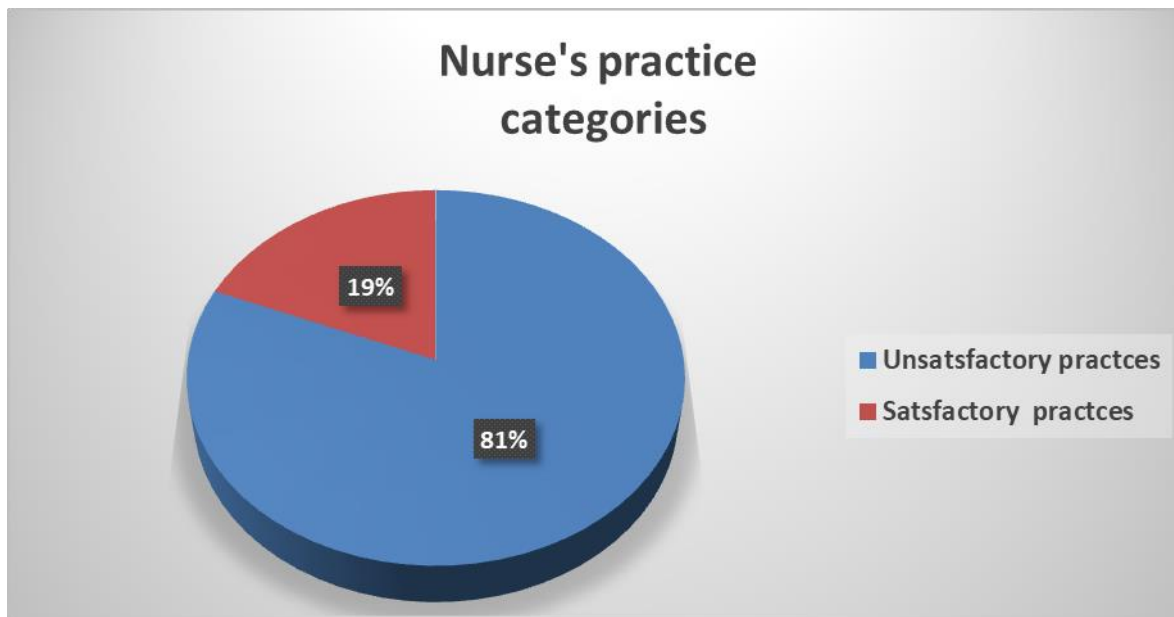| Variable		N=64	Percent
Total nurse's practice score (M&SD)		26.4688	7.42789
Nurse's practice categories	unsatisfactory practice	52	81.3%
	satisfactory practice	12	18.8%

Figure (2): Percentage distribution of nurses' practice score categories (N =64)

Table (4): Relationship between nurses' knowledge categories and their practice categories (N=64)

Nurse knowledge categories	Very low knowledge	Low knowledge	Satisfactory knowledge	Good knowledge	Very good knowledge	P – value	R - value
	N (%)	N (%)	N (%)	N (%)	N (%)		
Nurse practice categories							
M±SD	22.1 ± 2.3	22.2 ± 3.2	27.6 ± 4.0	37.3 ± 7.1	38.7 ± 4.3	.001*	.804
Unsatisfactory practice	25 (100.0%)	15 (100.0%)	10 (100.0%)	2 (25.0%)	0 (0.0%)	.001*	-
Satisfactory practice	0 (0.0%)	0 (0.0%)	0 (0.0%)	6 (75.0%)	6 (100.0%)		

Table (1): Sociodemographic data of the study sample: The mean age of the participants is approximately 28.42 years, with a standard deviation of 3.89. The majority, 70.3% (45 individuals), have attended a Technical Institute of Nursing. Regarding year of experience among participants: 34.4% (22 individuals) have >2–5 years of experience. Regarding type of ICU: The largest place of nurses among the participants 28.1% (18 individuals) work in the coronary ICU, and followed by 26.6% (17 individuals) in the hepatic ICU.

Table (2): The total knowledge score has a standard deviation of 5.74920 and a mean of 24.2031, indicating some variability in scores among the nurses. The largest percentage of nurses (39.1%) fall into the "very low knowledge" category, with 25 nurses in this category. This suggests that a significant proportion of nurses have limited knowledge related to the topic being assessed. Majority of nurses have inadequate knowledge: Approximately 64% of nurses had either very low or low knowledge about IAH.

Figure (1): The largest percentage of nurses (39.1%) fall into the "very low knowledge" category, The percentage of nurses (23.4%) fall into the " low knowledge" category, only The percentage of nurses (9.4%) fall into the "very good knowledge" category, the percentage of nurses (12.5%) fall into the "good knowledge" category, The percentage of nurses (15.6%) fall into the "satisfactory knowledge" category,

Table (3): The total practice score has a standard deviation of 7.42789 and a mean of 26.4688, indicating some variability in scores among the nurses. The largest percentage of nurses (81.3%) falls into the "unsatisfactory practice" category, with a

total of 52 nurses in this category. A smaller percentage of nurses (18.8%) fall into the "satisfactory practice" category, with a total of 12 nurses in this category. Majority of nurses have unsatisfactory practices: Approximately 81% of nurses had scores below the midpoint, indicating insufficient adherence to recommended practices. Variations in practice: Nurses with satisfactory practice had significantly higher scores than those with unsatisfactory practice.

Figure (2): The largest percentage of nurses (81.3%) falls into the "unsatisfactory practice" category, a smaller percentage of nurses (18.8%) fall into the "satisfactory practice" category.

Table (4): The Pearson correlation coefficient (R-value) between nurses' knowledge categories and their practice categories is 0.804, indicating a strong positive correlation between the two variables. This means that as nurses' knowledge scores increase, their practice scores also tend to increase. The p-value associated with this correlation is less than 0.001, indicating that the observed correlation is statistically significant and unlikely to be due to chance.

The table also shows the mean knowledge scores for each knowledge category, as well as the percentage of nurses in each knowledge category who fall into each practice category. The mean knowledge scores range from a low of 22.1 ± 2.3 for the "very low knowledge" category to a high of 38.7 ± 4.3 for the "very good knowledge" category. This indicates that nurses with higher knowledge scores tend to have better knowledge of the topic being assessed.

With regards to practice categories, all nurses with "inadequate practice" fall into the "low knowledge" or "very low knowledge" categories, while all nurses with "satisfactory practice" fall into the "good knowledge" or "very good knowledge" categories. This suggests that nurses' knowledge is a critical factor in their practice related to the topic being assessed.

Key Findings:
Majority of nurses have inadequate practices: Approximately 81% of nurses had scores below the midpoint, indicating insufficient adherence to recommended practices.
Variations in practice: Nurses with satisfactory practice had significantly higher scores than those with inadequate practice.

Key Findings:
Knowledge is associated with practice: Nurses with better knowledge of IAH were more likely to adhere to recommended practices.
Significant association: The p-value of 0.001 indicates a highly statistically significant association between knowledge and practice.

The R-value between educational qualification and knowledge is 0.015, indicating a very weak positive correlation. The p-value associated with this correlation is 0.905, indicating that the observed correlation is not statistically significant. Similarly, the R-value between educational qualification and practice is 0.046, with a p-value of 0.719, indicating a very weak positive correlation that is not statistically significant. These findings suggest that educational qualification is not a significant factor in nurses' knowledge or practice related to IAP.

The R-value between experience and knowledge is -0.010, indicating a very weak negative correlation. The p-value associated with this correlation is 0.939, indicating that the observed correlation is not statistically significant. Similarly, the R-value between experience and practice is 0.024, with a p-value of 0.851, indicating a very weak positive correlation that is not statistically significant. These findings suggest that experience is not a significant factor in nurses' knowledge or practice related to IAP.

The R-value between ICU type and knowledge is -0.108, indicating a weak negative correlation. The p-value associated with this correlation is 0.396, indicating that the observed correlation is not statistically significant. Similarly, the R-value between ICU type and practice is -0.134, with a p-value of 0.293, indicating a weak negative correlation that is not statistically significant. These findings suggest that ICU type is not a significant factor in nurses' knowledge or practice related to IAP.

The R-value between having received education about IAP and knowledge is 0.449, indicating a moderate positive correlation. The p-value associated with this correlation is less than 0.001, indicating that the observed correlation is statistically significant. Similarly, the R-value between having received education about IAP and practice is 0.557, with a p-value of less than 0.001, indicating a strong positive correlation that is statistically significant. These findings emphasize the importance of targeted educational interventions in enhancing nurses' knowledge and practice regarding IAP management.

Knowledge is associated with practice: Nurses with better knowledge of IAH were more likely to adhere to recommended practices. With regards to practice categories, all nurses with "unsatisfactory practice" fall into the "low knowledge" or "very low knowledge" categories, while all nurses with "satisfactory practice" fall into the "good knowledge" or "very good knowledge" categories. This suggests that nurses' knowledge is a critical factor in their practice related to the topic being assessed.

Discussion:

In the light of the nurses' demographic data, the average age of the participating nurses was approximately 28.42 years which aligns with findings by **Mahdy, et al. (2019)** Their study, titled Efficacy of Safety Measures and Discharge Planning Guidelines on Nurses for Enteral Nutrition of Comatose Patients, revealed that most nurses were between 20 and 30 years old. However, this differs from **Ahmed et al. (2015),** who found that nearly half of the nurses were over 30 years old in their study at Alexandria University on predictors of post-cardiac catheterization hematoma and bleeding. From the investigator's perspective, these findings may reflect the tendency of older nurses to hold administrative positions rather than work in intensive care units, as well as their general reluctance to engage in intensive or critical care settings.

Regarding to their educational level, most nurses in this study (over three-quarters) held a Technical Institute of Nursing qualification, contrasting with the results of **Jabr, et al. (2022)**. Their study, Nurses' Knowledge and Practice Regarding Care for Patients Undergoing Cardiac Catheterization, found that three-quarters of participants held only a secondary school diploma.

Regarding to work experience, the majority had between 2 and 5 years, differing from **Thabet et al. (2019).** In their thesis at Assiut University Hospital, Effect of Developing and Implementing Nursing Care Standards on Outcomes of Patients Undergoing Cardiac Catheterization, Thabet et al. reported that participants' experience ranged from 5 to 10 years (M = 7.18, SD = 4.25).

Regarding to Type of Intensive Care Unit Most nurses worked in coronary ICUs, with 26.6% in hepatic ICUs. This finding aligns with **Omnia et al. (2022**), while research by **Mobed et al. (2016)** supports this trend. However, **Chipu et al. (2017)** offered a different perspective, casting some doubt on these

In terms of Nurses' Knowledge, the majority of nurses scored inadequately. **Omnia et al. (2022)** found that 50% of surveyed nurses were unfamiliar with intra-abdominal pressure (IAP) definitions, normal values, or IAH criteria. This lack of knowledge is consistent with **Hunt et al. (2017),** who reported that critical care nurses generally lacked understanding of IAH and ACS. In contrast, **Strang et al. (2017)** found that Dutch surgeons had a strong grasp of IAH and ACS criteria, despite challenges in diagnosis and treatment. **Mahran et al. (2018)** further indicated that nurses' knowledge of IAP, IAH, and ACS improved significantly after a teaching program. Similarly, **Wise et al. (2019)** noted that over 63% of their participants could accurately define IAP and

IAH, know typical values, and identify organ dysfunctions associated with ACS. However, only 20% of nurses in the current study showed a satisfactory level of knowledge, potentially due to a lack of previous ACS training and intensive workloads in ICUs that reduce their capacity to absorb information.

In terms of Nurses' Practice, majority of the nurses demonstrated unsatisfactory skills in measuring IAP. This finding is similar to that of **Omnia et al. (2022),** where over 71.7% of nurses were incompetent in IAP measurement. **Mahran et al. (2018)** reported that nearly 68.8% of pre-teaching program participants had poor IAP measurement skills. However, **Newcombe et al. (2012)** found that most pediatric critical care nurses were conducting IAP measurements regularly.

Regarding to "relationship between the studied nurses' knowledge categories and their practice categories", The Pearson correlation coefficient (R = 0.804, p < .001) between nurses' knowledge and practice categories in this study indicates a strong, statistically significant positive relationship. This suggests that higher knowledge scores correlate with improved practice scores. Consistent with these results, **Khaliel, Mohamed, and Ghonaem (2022**) observed a similar correlation, revealing that increased knowledge led to improved practice in their study on safety measures in cardiac catheterization units. These findings In contrast with the study done by **(Strang et al, (2017)** who conducted a study of " Recognition and management of intra-abdominal hypertension and abdominal compartment syndrome; a survey among Dutch surgeons" that demonstrated the awareness and knowledge of the surgeon with the largest relevant experience and knowledge, but the clinical practice guidelines use is limited.

Conclusion:

The study concludes that the majority of nurses lack the knowledge and practical skills necessary for accurately measuring intra-abdominal pressure. These deficiencies could have serious implications for patient outcomes, particularly for those at risk of IAH and ACS.

Recommendation:

- continuous educational programs be implemented, focusing on the measurement of IAP, understanding of IAH, and prevention of ACS.
- Implementation of standardized protocols and quality control measures.
- Increased collaboration and mentorship to support nurses in adhering to recommended practices.

References:

- **Ahmed, IM. (2015):** Predictors of Post -Cardiac Catheterization Femoral Artery Hematoma and Bleeding. Journal of American Science, 2015) (11(3):16-22.
- **Allen, R., &Sarani, B. (2020):** Evaluation and management of intraabdominal hypertension. Current Opinion in Critcal Care, 26(2), 192-196
- **Chipu M, Kearns I, & Nel W (2017):** Experiences of registered nurses caring for patients with an open abdomen in an intensive care unit in Gauteng. Health Sa Gesondheid., 22: 166-173.
- **El Sayed Khaliel W, Said Mohamed S, & El sayed Ghonaem S (2022):** Evaluate Nurses' Performance regarding Safety Measures in Cardiac Catheterization Unit at Benha University Hospital and Suggested Guidelines. Journal of Nursing Science Benha University, 3(1):64-77.
- **El-Gawad A, Hala A, & Taha N (2019):** Effect of education program on nurses performance regarding traumatized patient care during the golden hour in emergency room at Zagazig University Hospital. Zagazig Nursing Journal, 15(2):139-157.
- **Gotlieb, M., Koyfman, A., & Long, B. (2020):** Evaluation and management of abdominal compartment syndrome in the emergency department. The Journal of Emergency Medicine, 58(1),43-53
- **Hunt L, Frost S, & Newton P (2017):** A survey of critical care nurses' knowledge of intra-abdominal hypertension and abdominal compartment syndrome. Australian Critical Care, 30(1):21-27.
- **Jabr, E., Taha, N., &Metwally, E. (2022):** Nurses' Knowledge and Practice Regarding Care for Patients Undergoing Cardiac Catheterization. Zagazig Nursing Journal, 18(1), 1-15.
- **Kahana, N., Schwartz, A. D., & Einav, S. (2022):** Decompressive laparotomy for veno-vmembrane oxygenaton failure due to intraabdominal hypertension in critcally Ill COVID-19 patent. The American Surgeon, 00031348221114520enous extracorporeal.
- **Kirkpatrick, A., Roberts, D., De Waele, J., Jaeschke, R., Malbrain, M. L., De Keulenaer, B., Ejike, J. (2013):** Intra-abdominal hypertension and the abdominal compartment syndrome: updated consensus definitions and clinical practice guidelines from the World Society of the Abdominal Compartment Syndrome. Intensive care medicine, 39(7), 1190-1206.
- **Mahdy, A. Y., Hamed, L. A., &Shehata, A. A. M. (2019):** Efficacy of Safety Measures and Discharge Planning Guidelines on Nurses for Enteral Nutrition of Comatose Patients. International Journal of Novel Research in Healthcare and Nursing, 6(3), 220- 231.
- **Mahran G, Abozied S, & Ahmed (2018):** Effect of teaching program on nurses' knowledge and skills and development of abdominal compartment syndrome among intensive care patients. Journal of Nursing and Health Science, 7:1-12
- **Makic, M. (2021):** Recognizing and Nursing Management of Abdominal Compartment Syndrome. Journal of Perianesthesia Nursing: Ofcial Journal of the American Society of Perianesthesia Nurses, 36(6), 732-733.
- **Mobed K, Makhlouf N, Abd Almageed A (2016):** Effect of Designed Nursing Guidelines on Nursing Intervention to Reduce Complications for Cirrhotic Patients Undergoing Paracentesis. Assiut Scientific Nursing Journal, 4(8): 33-45.
- **Nansubuga, P., Mwanje, A. K., Kizito, S., Obua, D., Sendagire, C., & Kwizera, A. (2020):** The prevalence, incidence and mortality associated with intra-abdominal hypertension among patients in intensive care units of a low-income country: a cohort study. Open Research Africa, 3(53), 53.
- **Newcombe J, Mathur M, & Bahjri K (2012):** Pediatric critical care nurses' experience with abdominal compartment syndrome. Annals of Intensive Care, 2(1):1-7.
- **Omnia, R., Furat, H., & Sabah, N. (2022):** Assessment of Nurses' Knowledge and Practice Regarding Intra- Abdominal Pressure Measurement and Abdominal Compartment Syndrome Prevention. African Journal of Health, Nursing and Midwifery. 5. 43-59. 10.52589/AJHNM-N7WUEQQN.
- **Pereira, R., Virella, D., Perdigoto, R., Marcelino, P. Saliba, F., & Germano, N. (2023):** Contnuous passive paracentesis versus largevolume paracentesis in the preventon and treatment of intraabdominalprotocol for a randomized controlled trial. Trials, 24(1), 1-11.
- **Smit, M., van Meurs, M., & Zijlstra, J. (2022):** Intra-abdominal hypertension and abdominal compartment syndrome in critcally ill patents: A narratve review of past, present, and future steps. Scandinavian Journal of Surgery, 111(1), 14574969211030128.
- **Smit, M., van Meurs, M., &Zijlstra, J. (2021).** Intra-abdominal hypertension and abdominal compartment syndrome in critcally ill patents: A narratve review of past, present, and future steps. Scandinavian Journal of Surgery, 14574969211030128.
- **Strang S, Van Lieshout E, & Verhoeven R (2017):** Recognition and management of intra-abdominal hypertension and abdominal compartment syndrome; a survey among Dutch surgeons. European Journal of Trauma and Emergency Surgery, 43(1):85-98

- **Tayebi S, Guterrez A, Mohout I et al. (2021):** A concise overview of non-invasive intra-abdominal pressure measurement techniques: from bench to bedside. Journal of Clinical Monitoring and Computng, 35(1):51-7

- **Thabet, O., Ghanem, H., Ahmed, A., & Abd-ElMouhsen, S.** Assessment of Nurse's knowledge and practice for patients undergoing Cardiac Catheterization. Assiut Scientific Nursing Journal**, (2019) 7(17), 95-101.**

- **Wise R, Rodseth R, Blaser A (2019): Awareness** and knowledge of intra-abdominal hypertension and abdominal compartment syndrome: results of a repeat, international, cross-sectional survey. Anaesthesiology Intensive Therapy, 51(3):186-99.