

## **Association between Metacognitive Awareness of Pediatric Nursing Students and Their Academic Achievement: A Correlational Study**

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**Background:** Metacognition is a crucial skill for critical thinking and self-regulation particularly for pediatric nursing students, which can affect and help to monitor and regulate thinking, understanding, and problem-solving. **Purpose:** To assess the association between metacognitive awareness of pediatric nursing students and their academic achievement. **Design:** A descriptive correlational research design was utilized. **Setting:** Faculty of Nursing, Damanhour University, Egypt. **Sampling:** A purposive sample of 150 pediatric nursing students in second semester of academic year 2022-2023. **Instruments:** two instruments were used namely; Metacognitive Awareness Inventory and The Pediatric Nursing Achievement Test. **Results:** The mean total score of overall total meta-cognitive awareness level was 33.06 + 13.155, while the mean total score of total achievement level was 19.84+4.03. Furthermore, a statistical very highly significant strong positive correlation was found between total students' achievement levels and their overall meta-cognitive awareness, where  $r = 0.877$  and  $p < 0.001$ . **Conclusion:** There is a strong positive association between metacognitive awareness of pediatric nursing students and their academic achievement. **Recommendations:** Teachers should be trained to pose classroom questions to increase students' metacognition awareness and achievement, as well as the number of course hours in which students are left in real life situations trying to solve problems, use higher level cognitive skills in Bloom Taxonomy and use their reflective thinking skills should be increased.

**Keywords:** *Academic achievements, Metacognitive awareness; Pediatric nursing; Students.*

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## **Introduction**

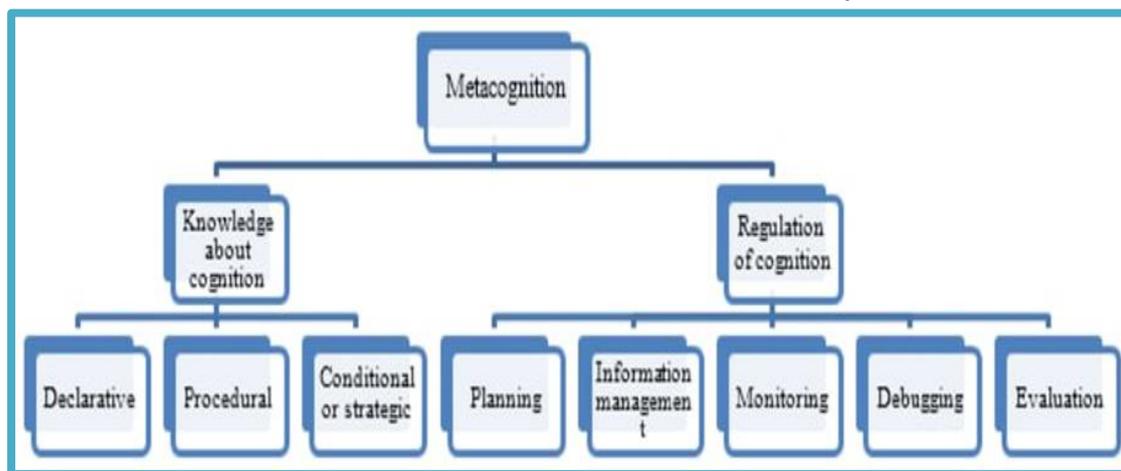
Recently, health care team has been facing fast changes in the system of health care, as a result of changing diseases patterns, new discoveries for medical treatment and using technological advancements. Therefore, the pediatric nurse as a core member of this team should be able to apply high standards of care for children and their families (Mott et al., 2018). Consequently, educational systems realize that, and they are in challenging and continually redesign learning experience and update teaching strategies to ensure optimum students' achievements and enable nursing students to handle with these challenges. Therefore, the academic instructors have to encourage nursing students to promote using high thinking skills, lifelong learning, problem-solving, group-based skills and creativity. Such a process provides them with extensive tools to maintain learning and will enable them to perceive things in new ways (Moore, et al., 2005). Thus, education should be related and accommodated to the profession future and offers learning opportunities that correspond with curriculum to be successful (Bengtsson and Ohlsson, 2010).

In new approaches, rapid developments in science and technology have had positive effects on the quality of education. As known, the central point of education is to

teach students to think, use their rational powers and become better problem solvers (Sewell, 2023 and Papathanasiou, et al., 2014). Recent studies have shown that teachers need the drive of students' metacognitive awareness. (Shasha. et al., 2022)

Metacognition is defined as “the activity of monitoring and controlling one’s cognition” (Young and Fry, 2012). It is comprised of two components: “knowledge about cognition (metacognitive knowledge) and regulation of cognition (metacognitive regulation)” (Fig. 1) (Schraw and Dennison, 1994). Knowledge about cognition can help pediatric students to recognize their strengths and weaknesses, and thereby influencing their motivation and interest in learning. “It has three components, i.e. declarative, procedural, and conditional knowledge”. Declarative knowledge is the knowledge of what one knows, how to learn and what factors influence the learning process (Young and Fry, 2012). Procedural knowledge is the knowledge about successful methods used to attain certain learning goals and an awareness of how specific cognitive capabilities are used in the learning process (Backer et al., 2011). Conditional knowledge is the alertness of how, when, and where to apply specific strategies (Sugiharto et al., 2018).

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**Fig. 1. Metacognition components** (Schraw and Dennison, 1994)

Regulation of cognition comprises; “activities that regulate students' ability to think and learn such as, planning, information management, monitoring, debugging, and evaluation”. It considers a trigger for evaluating and adjusting students' learning strategies. According to Schraw and Dennison (1994), planning refers to goal setting, and allocating resources prior to learning. Whereas, information management is skills and strategy sequences used online to process information more efficiently. Monitoring is appraisal of cognitive processing plans (Efklides, 2009). Debugging is strategies used to correct understanding and performance of mistakes (Schraw and Dennison, 1994). Evaluation is self-judging of the response and of the method of accomplishment of this response (Deseote et al., 2001). Knowledge and regulation of cognition are correlated, but not simply compensatory. Studies show that students with greater knowledge about cognition perform better on tests. However, if their ability to regulate

cognition declined, students will have unreasonable planning and self-debugging, which in turn affect their exam results. Recent studies have revealed that metacognitive awareness contributes to the development of critical thinking and positive learning abilities. Students with low metacognitive awareness often assume ineffective learning strategies and being unable to think critically or to develop practical skills to deal with learning challenges (Asadzandi, et al., 2022).

The pediatric nurse is seen as a key person in the multidisciplinary team caring for pediatric patients. The development of metacognitive skills is essential for pediatric nursing students to reorient themselves and being aware of their learning strategies, their strengths and weaknesses, which in turn leading to self-mastery of their learning process. In the classroom and practical environment, academic educators can support pediatric nursing students in developing metacognitive skills by careful planning,

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implementing, monitoring and evaluating learning activities within course work and curriculum (Melissa, et al., 2017). Additionally, pediatric nurses with higher levels of metacognitive skills are able to provide valuable care through better clinical reasoning. The same is needed for nursing students' performance in examinations, as the more they think metacognitively, the better their test results are. (Asadzandi, et al., 2022).

### **Purpose:**

The purpose is to:

- Assess the association between metacognitive awareness of pediatric nursing students and their academic achievement.

### **Research Question**

- What is the association between metacognitive awareness of pediatric nursing students and their academic achievement?

### **Methods**

#### **Design:**

A descriptive correlational research design was carried out.

#### **Setting:**

The study was conducted in pediatric department at the Faculty of Nursing, Damanhour University, Egypt. Pediatric nursing is one of the main courses that was taught each term for the students in the third scholastic year. Each term is consisting of 15 weeks. The clinical training (rotation) is given 12 hours /week.

#### **Sampling:**

The present study sample contained 150 students. The sample size was

determined by using EPI Info program version 10 using the following information: Population size = 500 (total no. of pediatric nursing students during the 2nd term of the academic year 2022 -2023), expected frequency =50%, acceptable error= 10%, confidence coefficient = 99%, which revealed a simple size = 125. Pediatric nursing students are divided equally into 10 clinical groups. Fifteen students from each group were selected from the students' attendance list randomly till reaching the required sample size (150 students).

### **Instruments:**

To collect data, researchers used two instruments.

#### **Instrument one: Metacognitive Awareness Inventory (MAI):**

To describe levels of student's metacognitive thinking skills, the researchers adopted the Metacognition Awareness Inventory (MAI), which was developed by Schraw and Dennison (1994). It consisted of eight factors assessed by 52 items and divided into two broad subscales which are Knowledge and regulation of cognition. The first part: Knowledge about cognition (17 items) included three subdomains namely; declarative knowledge (7 items), procedural knowledge (4 items), and conditional knowledge (6 items). The second part: Regulation of cognition (35 items). It contained five subdomains that are; planning (7 items), information management strategies (9 items), comprehension monitoring (8 items), debugging strategies (5 items), and evaluation (6 items). It was scored as

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follows: One point Score for true answer and zero for false” answer. The Overall total score was 52 marks, classified as follows; low metacognitive awareness level (0 - 17 marks), moderate metacognitive awareness level (18 - 34 marks) and high metacognitive awareness level (35 - 52 marks).

**Instrument two: The Pediatric Nursing Achievement Test (PNAT).**

It was developed by the researchers guided by the Pediatric Nursing notes that were developed by the Pediatric Nursing Staff of the Faculty of Nursing, Damanhour University (2020)( Pediatric Nursing Staff, 2020). This instrument consisted of higher and lower cognitive level questions to assess nursing students’ achievement levels. It consisted of 10 multiple choice questions (MCQ), 10 true and false questions and 3 open ended questions based on pediatric nursing topics. Each question was graded as follows: MCQ & true and false questions one mark for right answer and zero for wrong answer. Total score was 20. For open ended questions, two grades were provided for complete, one for incomplete and zero for incorrect answers. Total score ranged from zero to six. The total score of PNAT level was 26 marks. It was classified as follows; low students' achievement level (0 - 8 marks), moderate students' achievement level (9 - 16 marks) and high students' achievement level (17 - 26 marks). Pediatric nursing students’ personal and academic characteristics as: age,

gender, and last certificate were attached to this instrument.

**Validity**

The instruments were submitted to a panel of 7 experts of nursing education and pediatric nursing (3 professors in nursing education and 4 professors in pediatric nursing) to test its face validity, clarity, and relevancy, and suggested amendments were done.

**Reliability:**

Cronbach Alpha Coefficient was used to ascertain the reliability of the instruments. In instrument one, the reliability of the two subscales (knowledge about cognition& regulation of cognition) was high, as  $r=0.80$  and  $r=0.96$  respectively. Reliability of instrument two was ( $r=0.813$ ).

**Pilot study:**

A pilot study was done on 15 students (10% of total sample), in order to test the instruments' relevance, clarity, applicability and feasibility and necessary modification were done. They were excluded from the study population.

**Procedure:**

A letter was submitted to the Dean of the Faculty of Nursing, Damanhour University explaining the purpose of the study and methods of data collection to obtain the permission for data collection. Before instruments administration students were thoroughly briefed about the purpose of the study and methods of data collection. The instruments were distributed by the researchers among the students as follows: The pediatric

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nursing students groups pass through many clinical rotations one of them was medical rotation where they deal with various diagnosis and are exposed to clinical situations which need different metacognition abilities.

Last day of medical rotation for each group the two instruments were administered to the selected students (15 students /group). All questions have to be answered by the students. The data was gathered over a period of three months through the second term of the academic year 2022 -2023.

**Ethical considerations:**

Approval from the Ethical Research Committee of the Faculty of Nursing at Damanhour University was obtained to conduct the study before performing the study. The respondent rights were protected by ensuring voluntary participation, so the informed consent was obtained after explaining the purpose, potential benefits of the study, how data was collected, expected outcomes and the respondent's rights to withdraw from the research study at any time in case of violation of his rights. The respondents were assured that the data would be treated as strictly confidentially by coding it. The respondent's anonymity was maintained. They were assured that their answers have no influence on their grades

**Statistical Analysis**

Data collected from the studied sample was revised, coded, entered and Statistical analysis were fulfilled using the Statistical Package for Social Sciences (SPSS) version 23. Data were presented using Descriptive statistics

such as, number and percentage, mean and standard deviation were used to describe students' personal and academic characteristics. Analytical statistics included the Chi-square test (X<sup>2</sup>) and Mont Carlo tests (MCP), were used to test the association between the variables. Spearman rank correlation coefficient ( $\rho=\text{rho}$ ) was used to measures the correlation between variables which do not follow the normal distribution (non-parametric. The correlation coefficient (r) was used to measure the strength and direction of a linear relationship between two or more variables. A statistical significant difference was considered if  $P<.05$ , a highly statistical significant difference was considered if  $P <.01$  and a very highly statistical significant difference was considered if  $P<.001$

**Results**

**Table 1** indicates the distribution of studied students according to their personal and academic characteristics. It was noticed that the majority of the students were more than 20 years old (88.7%) with mean age was 21.64+0.957 years. Moreover, 56.7% of them were females. As regards to last certificate, the same table illustrated that the majority of the studied students had general secondary school certificate (82.7%)

**Table 2 and Fig. 2** represent the total mean score of pediatric nursing students' meta-cognitive awareness levels. It was observed that more than half of the students' had high overall meta-cognitive awareness levels (55.3%) with mean total score was 33.06 + 13.155. Concerning

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knowledge of cognition, nearly two thirds of them experienced high level (62%) with mean subtotal score  $10.84 + 3.576$  where, 74.7% and 55.3% of them had high knowledge meta-cognitive awareness levels in declarative and conditioning knowledge respectively. While in procedural knowledge more than two thirds of students experienced moderate knowledge meta-cognitive awareness level (70.7%). It showed also that 53.3% of the students' had high level of regulation of cognition with mean subtotal score was  $22.22 + 9.636$  as, 56.7% and 66.7% of them experienced high level of regulation meta-cognitive awareness in planning and information management strategies respectively. Moreover, half of students had moderate level of regulation meta-cognitive awareness in comprehension monitoring and debugging strategies (50.7% for each). On the other side, in evaluation the regulation of meta-cognitive awareness level was low as it was experienced by approximately one third of studied students (34.7%).

The total mean score of academic achievement levels of pediatric nursing students are illustrated in **Table 3 and Fig. 3**. It was noticed that the majority of the studied students experienced high total achievement levels (84.7% with a total mean score was  $19.84+4.03$ ). Furthermore, slightly more than two thirds of them answered the higher and lower cognitive questions and obtained high achievement levels (80% and 80.7% respectively) but the total mean scores of students who answered higher

cognitive questions was the lowest ( $4.76+1.047$ ).

**Table 4** illustrates the association between the pediatric nursing students' meta-cognitive awareness and their achievement levels. It was clear that there were highly statistically significant differences between the overall meta-cognition, higher cognitive questions, lower cognitive questions and total students' achievement ( $p < 0.001$  for each). Whereas, all students who had moderate meta-cognitive awareness achieved high scores in higher cognitive questions. Also, 100% and 95% of them who had either high or moderate meta-cognitive awareness obtained high scores in lower cognitive questions. Likewise, all students whose meta-cognitive awareness was high and moderate achieved high scores in their total achievement.

Association between the pediatric nursing students' personal and academic characteristics and their meta-cognitive awareness levels was shown in **Table 5**. It was found that all students who aged less than 20 years as well as nearly half (49.6%) of those who were more than 20 years had high metacognition awareness, with a very highly statistical significant difference between them ( $p < 0.001$ ). Concerning students' sex, almost all students who had high meta-cognitive awareness were females (97.6%), while, about two thirds (58.5%) of males had moderate meta-cognitive awareness and the difference was very highly statistically significant ( $p < 0.001$ ). Regarding last certificate, the same table proves also that 66.9% of the

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students who were graduated from general secondary school had high meta-cognitive awareness. However, all of those (100%) who were graduated from technical nursing institute had moderate meta-cognitive awareness and a very highly statistical significant difference was found ( $p < 0.001$ ).

**Table 6** displays the association between the pediatric nursing students' personal and academic characteristics and their academic achievement levels. It was found that all students (100%) who aged less than 20 years and the majority (82.7%) of those who were more than 20 years had high achievement levels. No statistical significant difference was found between them. Concerning student's sex, all females and 64.6% of male students had high achievement levels and the difference was very highly statistically significant ( $p < 0.001$ ). Concerning the last certificate, the same table verifies also that all students who were graduated from general secondary school had high achievement levels, while more than three quarters (76.9%) of those who had moderate achievement levels were graduated from technical nursing institute. The statistical difference between them was very highly significant ( $p < 0.001$ ).

The correlation between mean total score of pediatric nursing students' academic achievement and their meta-cognitive awareness levels was

illustrated in **Table 7**. It was found from the table that there was a moderate negative correlation between mean total of pediatric nursing students' higher cognitive questions score and their meta-cognitive awareness, where the high the meta-cognitive awareness level, the low the students' higher cognitive questions score and the difference was very highly statistical significant where  $r = -0.521$  for knowledge of cognition,  $r = -0.603$  for regulation of cognition and  $r = -0.584$  for overall meta-cognition,  $p < 0.001$  for each. It was noticed also from the same table that there was a strong positive correlation between mean total of pediatric nursing students' lower cognitive questions score and their meta-cognitive awareness, where the high the meta-cognitive awareness level, the high the students' lower cognitive questions score and the difference was very highly statistical significant, where  $r = 0.938$  for knowledge of cognition,  $r = 0.923$  for regulation of cognition and  $r = 0.931$  for overall meta-cognition,  $p < 0.001$  for each. In addition, there was a strong positive correlation between total students' achievement levels and their meta-cognitive awareness, where the higher the meta-cognitive awareness levels, the higher the total students' achievement levels ( $r = 0.877$  for knowledge of cognition,  $r = 0.840$  for regulation of cognition and  $r = 0.853$  for overall meta-cognition,  $p < 0.001$  for each).

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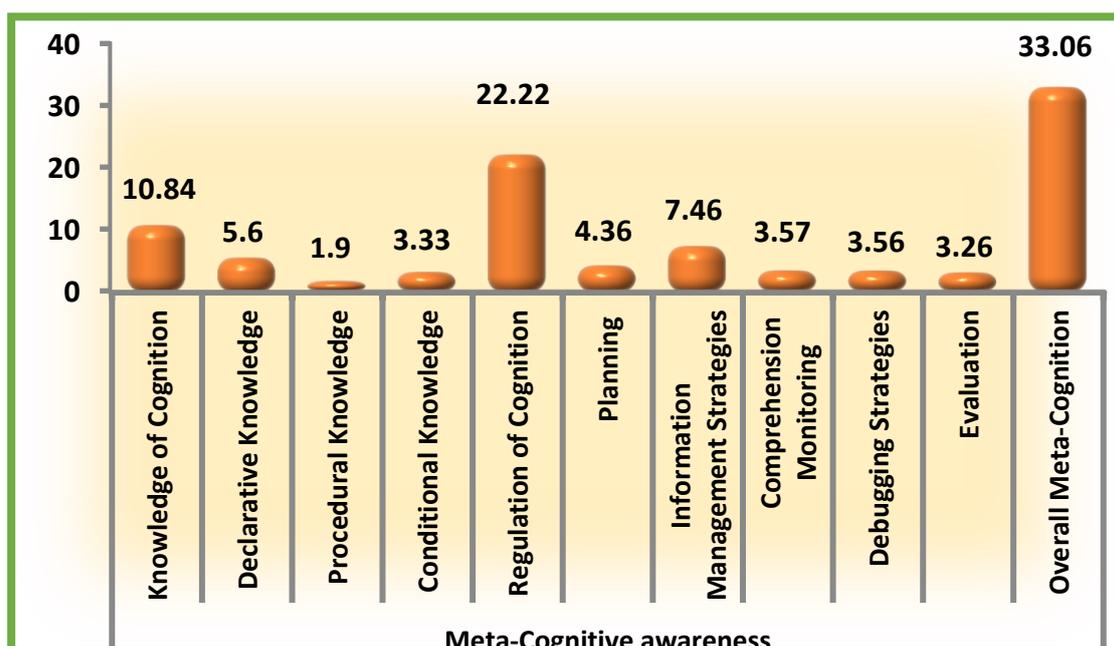
**Table 1: Distribution of Pediatric Nursing Students according to their Personal and Academic Characteristics (n=150)**

Pediatric Nursing Students' Personal and Academic Characteristics		No	%
Age / years	• Less than 20	17	11.3
	• More than 20	133	88.7
Mean+ SD Min-Max		21.64+0.957 / 19-23	
Sex	• Male	65	43.3
	• Female	85	56.7
Last certificate	• General secondary school	124	82.7
	• Technical nursing institute	26	17.3

**Table 2: Pediatric Nursing Students' Meta-Cognitive awareness Levels of (n=150)**

Pediatric Nursing Students' Meta-Cognitive Awareness Levels	Low		Moderate		High	
	No.	%	No.	%	No.	%
<b>Knowledge of Cognition</b>	21	14.0	36	24.0	93	62.0
• Declarative Knowledge	5	3.3	33	22.0	112	74.7
• Procedural Knowledge	29	19.3	106	70.7	15	10.0
• Conditional Knowledge	26	17.3	41	27.3	83	55.3
<b>Regulation of Cognition</b>	30	20.0	40	26.7	80	53.3
• Planning	32	21.3	33	22.0	85	56.7
• Information Management Strategies	16	10.7	34	22.7	100	66.7
• Comprehension Monitoring	37	24.7	76	50.7	37	24.7
• Debugging Strategies	37	24.7	76	50.7	37	24.7
• Evaluation	52	34.7	47	31.3	51	34.0
<b>Overall Meta-Cognition</b>	27	18.0	40	26.7	83	55.3

**Fig. 2. Total Mean Score of Pediatric Nursing Students' Meta-Cognitive awareness**

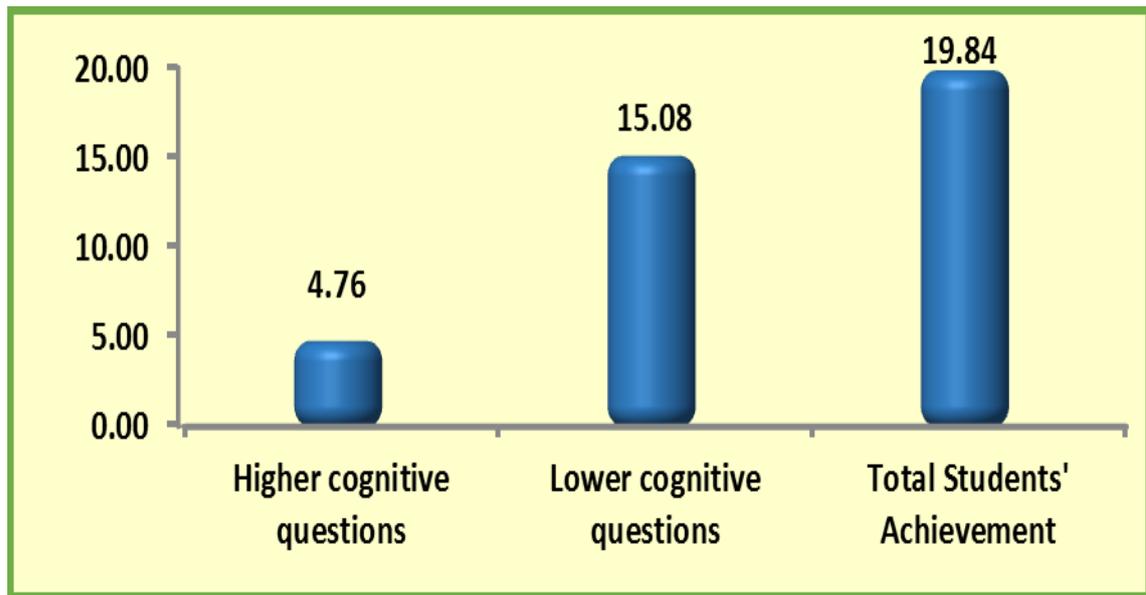


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**Table 3: Pediatric Nursing Students' Academic Achievement Levels (n=150)**

Pediatric Nursing Students' Academic Achievement Levels	Low Achievement		Moderate Achievement		High Achievement	
	No.	%	No.	%	No.	%
Higher cognitive questions	10	6.7	20	13.3	120	80.0
Lower cognitive questions	10	6.7	19	12.6	121	80.7
Total Students' Achievement	3	2.0	20	13.3	127	84.7

**Fig. 3. Mean Score of Pediatric Nursing Students' Academic Achievement.**



**Table 4: Association between the Total Meta-Cognitive Awareness Levels of Pediatric Nursing Students and their Academic Achievement Levels (n=150)**

		Higher cognitive Questions						Lower cognitive Questions						Total Achievement levels					
		Low (n= 10 )		Moderate (n= 20)		High (n= 120)		Low (n= 10 )		Moderate (n= 19)		High (n= 121)		Low (n= 3 )		Moderate (n= 20)		High (n= 127)	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Overall Meta-Cognition levels	Low (n= 27)	0	0.0	2	7.4	25	92.6	10	37.0	17	63.0	0	0.0	3	11.1	20	74.1	4	14.8
	Moderate (n= 40)	0	0.0	0	0.0	40	100.0	0	0.0	2	5.0	38	95.0	0	0.0	0	0.0	40	100.0
	High (n= 83)	10	12.0	18	21.7	55	66.3	0	0.0	0	0.0	83	100.0	0	0.0	0	0.0	83	100.0
Test of Significance X <sup>2</sup> / P value		PMC=0.000***						PMC=0.000***						PMC=0.000***					

X<sup>2</sup>: Chi-Square Test

<sup>MC</sup>P: Monte Carlo Test

Significant at \*P< 0.05

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**Table 5: Association between the Pediatric Nursing Students' Personal and Academic Characteristics and their Meta-Cognitive Awareness levels (n=150)**

Pediatric Nursing Students ' Personal and Academic Characteristics		Overall Meta-Cognition awareness levels						Test of Significance X2 / P value
		Low Meta-Cognition (n= 27)		Moderate Meta-Cognition (n= 40)		High Meta-Cognition (n= 83)		
		No.	%	No.	%	No.	%	
Age / years	• <20	0	0.0	0	0.0	17	100.0	<b>0.000*** =PMC</b>
	• >20	27	20.3	40	30.1	66	49.6	
Sex	• Male	27	41.5	38	58.5	0	0.0	<b>X2 = 142.262 P&lt;0.001</b>
	• Female	0	0.0	2	2.4	83	97.6	
Last certificate	• General secondary school	1	0.8	40	32.3	83	66.9	<b>X2 =143.280 P&lt;0.001</b>
	• Technical Nursing Institute	26	100.0	0	0.0	0	0.0	

**X2: Chi-Square Test    MCP: Monte Carlo Test    Significant at \*P< 0.05**

**Table 6: Association between the Pediatric Nursing Students' Personal and Academic Characteristics and their Academic Achievement Levels (n=150)**

Pediatric Nursing Students ' Personal and Academic Characteristics		Total students' Academic Achievement Levels						Test of Significance X2 / P value
		Low Achievement (n= 3 )		Moderate Achievement (n= 20 )		High Achievement (n= 127 )		
		No.	%	No.	%	No.	%	
Age / years	• <20	0	0.0	0	0.0	17	100.0	<b>0.180 =PMC</b>
	• >20	3	2.3	20	15	110	82.7	
Sex	• Male	3	4.6	20	30.8	42	64.6	<b>PMC=0.000***</b>
	• Female	0	0.0	0	0.0	85	100.0	
Last certificate	• General secondary school	0	0.0	0	0.0	124	100.0	<b>PMC=0.000***</b>
	• Technical Nursing Institute	3	11.5	20	76.9	3	11.5	

**X2: Chi-Square    MCP: Monte Carlo Test    Significant at \*P< 0.05**

**Table 7: The Correlations between Mean Total score of Pediatric Nursing Students' Academic Achievement levels and their Meta-Cognitive Awareness Levels (n=150)**

Students' Academic Achievement Levels	Meta-Cognitive Awareness Levels					
	Knowledge of Cognition		Regulation of Cognition		Overall Meta-Cognition	
	r	p	r	p	r	P
<b>Higher Cognitive Questions</b>	-0.521 **	0.000	-0.603 **	0.000	-0.584 **	0.000
<b>Lower Cognitive Questions</b>	0.938**	0.000	0.923**	0.000	0.931**	0.000
<b>Total students' academic achievement level</b>	0.877**	0.000	0.840**	0.000	0.853**	0.000

**r = Pearson Correlation                      \*\*. Correlation is significant at the 0.01 level (2-tailed).**

## **Discussion**

The core objective of training students of professional disciplines, including nursing students, is to help them learn how to learn. In this regard, developing metacognitive skills, besides critical thinking (cognitive skills) are considered important for the development of better clinical reasoning (Asadzandi, et al., 2022). Therefore, this study aimed to assess the association between metacognitive awareness of pediatric nursing students and their academic achievement.

Students' motivation and academic performance increase by high level of well-developed metacognitive thinking, that allowing them to enhance skills they possess, and become aware of those abilities they lack. The present study results pointed out that more than half of the pediatric nursing students had high level of the overall metacognitive awareness. This finding may be interpreted in the light of the fact that in new educational approaches, the instructors encourage the learners to use critical thinking, lifelong learning, problem solving, and teamwork. Furthermore, metacognitive knowledge refers to being aware of and having knowledge about one's own cognition (Salari, et al.2013). The results of the current study is consistent with Nguyen, et al., 2023, who concluded that medical students at the Vietnamese Military University were have a high metacognitive awareness score. Also, this result is matched with the findings of Ata and Abdelwahid, 2019 who concluded that nursing students' metacognitive thinking and goal

orientation were significant predictors of academic motivation (Nguyen, et al., 2023, Ata, and Abdelwahid, 2019). Referring to knowledge of cognition, about two thirds of pediatric nursing students experienced high level of metacognitive awareness, most of them had high level of metacognitive awareness in declarative knowledge and more than half of the students had high level in conditioning knowledge. While in procedural knowledge, more than two thirds of the nursing students experienced moderate level of metacognitive awareness. These results may be confirmed by the fact that knowledge of cognition means students' knowledge of their learning and metacognitive strategies. Where, declarative knowledge, that's the knowledge of what the students know, and the knowledge of how to learn and what factors affecting the learning process (Asadzandi, et al., 2022).

Also, conditional knowledge is related to knowledge about how can pediatric nursing students apply this knowledge which they already learned in another external condition appropriately as almost nurse educators, train them to make transferable intended learning outcomes. While, procedural knowledge is related to students' awareness of how specific cognitive skills or strategies are applied in learning situation (Al-Balushi, et al., 2022). This, from researchers' point of view really, needs more guidance and training from the teachers to students. Úmit Durik, 2020 supported the results of the present study, where the research showed that metacognitive

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skills can be improved through teaching (Úmit Durik, 2020). Also, these findings are reinforced by a previous study carried out by Aljaberi and Gheith, 2015, they found that the declarative knowledge had the highest mean score while, the procedural knowledge had the lowest mean score (Aljaberi, and Gheith, 2015).

In relation to regulation of cognition about half of nursing students had high level of the overall metacognitive awareness. As, about half to two thirds of the students experienced high level of regulation of cognition in planning and information management respectively. Half of them had moderate level of awareness in regulation of cognition related to comprehension monitoring and debugging strategies. Contrariwise, slightly one third of them had low level of metacognitive awareness in evaluation. These findings from the researchers' point of view were because planning, monitoring, debugging, and decision-making process are the role and responsibilities of the faculty instructors. These findings are supported by Aljaberi and Gheith, 2015, who found that the planning and debugging strategies as subdomains of the regulation of cognition constituted the lowest and highest mean percent scores, respectively (Aljaberi and Gheith, 2015).

Pertaining to the total mean score of students' achievement levels, the current study findings showed that the majority of the studied students obtained high total achievement levels in both the higher and lower cognitive

questions, although, the total mean score of students who answered higher cognitive questions was the lowest. These results may be interpreted in the light of, in classrooms, questions at a higher cognitive level are no better in eliciting higher-level responses in students than questions at a lower cognitive level ( Davoudi, and Sadeghi, 2015). This finding also could be due to that pediatric nursing students had a lot of tasks and responsibilities during their learning process; so they should be talents and have the required skills to set goals and put good plans for their academic assignments. These skills could in turn improve their levels of achievement. Kassaw and Astatke, 2017, were reported the same results (Kassaw and Astatke, 2017).The current results are supported by Abouelfettoh and Al Mumtin,2015, who emphasized the availability of clinical instructors provide effective assistance, and guidance for the students at any time instead of providing negative criticism for them. (Abouelfettoh and Al Mumtin 2015) As well as, the research results consistent with Saleh, 2019, who enforced that students' participation in a class discussion, asking questions and orienting with course objectives these items were recognized as the main elements which help in achieving successful educational process, potentiate utilization of student's skills as problem-solving, critical thinking, and encouraging active rather than passive learning (Saleh. 2019).

All nursing students had high achievement in lower cognitive

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questions level, this actually related to the competency of pediatric nursing students in lower cognitive questions level, and they need more training in higher cognitive questions level. Additionally, there were highly statistically significant differences between the overall metacognition, both higher, and lower cognitive questions and their total achievement. As, all students who had moderate metacognitive awareness achieve high score in higher cognitive questions. In addition, all, and almost all of them, who had either high or moderate metacognitive awareness obtain high score in lower cognitive questions respectively. These results may be explained in the light of that the achievement of the students who had moderate metacognitive awareness were more than those who had high metacognition. From the researchers' view, over occupation of thinking about thinking of students who had high metacognition may alter their achievement. These findings were consistent with Melissa, et al., 2017, who suggested that health care providers can be overconfident in their assessments leading to medical or nursing errors which can lead to hind sights bias which may further hinder learning (Melissa, et al., 2017). Concerning, the correlation between pediatric nursing students' achievements and their metacognitive awareness, the current study findings presented that total pediatric nursing students' achievements and lower cognitive questions score were significantly strong positively correlated to their overall total

metacognitive awareness, where the high the metacognitive awareness, the high total pediatric nursing students' achievements and the high lower cognitive questions score. On the other side, there was moderate negative and significant correlation between pediatric nursing students' higher cognitive questions score and their metacognitive awareness, where the high metacognitive awareness levels, the low the students' higher cognitive questions scores. These findings could be related to that self-regulation and self-directed learning are allowing students to choose for themselves what information they want to experience or learn. In a realistic learning situation this is difficult, and in a formal learning environment, information selection is limited and managed by the teacher (Gureckis and Markant, 2012). The present result is matched with Pradhan & Das 2021 and Mir & Peerzada 2022, who found a positive correlation between metacognition and academic achievement among students (Pradhan & Das, 2021) (Mir & Peerzada, 2022). On the other side, the results of the present study was controverted the study of Bernacki, et al., 2020, who showed that the metacognitive awareness of the higher-performing participants was consistently and significantly higher than that of the lower performing participants (Bernacki, et al., 2020). With reference to the relationship between the pediatric nursing students' personal and academic characteristics, and their metacognitive awareness levels. All students who aged less than twenty years, as well as about half of

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those who more than twenty years, had high metacognitive awareness with a highly statistically significant difference between them. Alexander, et al., 2019 findings contradicts the current study results, where younger adults may have higher metacognitive accuracy for their capacity, older adults can accurately assess their ability to selectively remember information, suggesting potentially separate metacognitive mechanism that are differentially affected by aging. Therefore, perhaps age was the factor here because generally students' experiences and maturity are increased in line with their ages (Alexander, et al., 2019).

Almost all students who had high metacognitive awareness in the current study were females. The present study finding was well-matched with the result of Abdelrahman. 2020, who concluded that female students showed a higher level of metacognitive knowledge and metacognitive regulation (Abdelrahman. 2020). On contrary, this result mismatched with the results of Özçakmak et al., 2021, as they found that mean scores of metacognitive knowledge for male and female students were very similar (Özçakmak, et al., 2021). In addition, Akin, and Arslan 2014, Demirel, et al., 2015 and Hemdan, 2012 results were not congruent with the results of the present study as they reported that there is no gender consensus regarding metacognitive skills in different levels of schooling (Akin, and Arslan 2014).(Demirel, et al., 2015 and Hemdan, 2012).

Regards, the relationship between the pediatric nursing students' personal and academic characteristics, and their achievement levels. All students who aged less than twenty years, as well as most of those who were more than twenty years, had high achievement level. These result were contradicted to the study conducted by Minkyung, and Sohyune, 2021 and showed that the younger the nursing students and the higher their academic achievement. It is thought that the younger a nursing student is, the higher in his or her curiosity about the subject, as well as his or her interest in mutually cooperative learning, which allows a student to learn along with their fellow students (Minkyung, and Sohyune, 2021)

The current study clarified that all students who had high achievement levels were females. This result was matched with various studies conducted on the interrelationship between students' gender and academic achievement by Kassaw and Astatke, 2017, who finally, disclosed that female students perform better than male students in both general and domain specific academic task (Kassaw and Astatke, 2017).

The current study showed that almost all general secondary school nurses had high achievement levels. This result from the researcher's point of view may be due to students' poor academic performance and dropout is their secondary school scores. There is a lower dropout rate among students with higher grades than with lower grades This finding is attached to the results of Al Husaini, et al., 2022, who

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indicate that students' entry grades cause the dropout through influence on university exams and activities, students with low entry grades are either voluntarily dropping out or are involuntarily withdrawn from their educational institution (Al Husaini, et al., 2022).

### **Conclusions**

Based on this research findings, it can be concluded that pediatric nursing students had high level of awareness in declarative, conditioning and procedural knowledge of cognition, descending. Also, they experienced high level of regulation of cognition in planning, information management, comprehension monitoring, debugging strategies, and evaluation, descending. Those likely to had high level of the overall metacognition awareness. It was noticed that the majority of the studied students' experienced high total achievement levels. Additionally, highly statistical significant correlations were found between the overall metacognition awareness, and higher and lower cognitive questions and their total achievement levels. Therefore, the current findings increase our understanding of the relationships between metacognition and pediatric nursing students' achievements.

### **Recommendations**

- Teachers should be trained to change their questioning behaviours and to use approaches other than questioning during classroom discussions (e.g., silence, making statements) are positively related to student achievement. Also, be trained to pose

classroom questions to increase students' metacognition awareness and achievement. The number of course hours in which students are left in real life situations trying to solve problems, use higher level cognitive skills in Bloom Taxonomy and use their reflective thinking skills should be increased. Future researches can be applied in the same topic in other nursing branches and Universities.

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