Developing Strategies to Enhance Throughput among Technical Nurse Students

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Abstract

Background: Nursing education plays a vital role in promoting public health and advancing healthcare systems worldwide, making the development of strategies to enhance throughput crucial for ensuring timely graduation and meeting healthcare demands. **Aim of the study:** This study aimed to develop strategies to enhance throughput among technical nurse students at Al- Sharkia governorate**. Subjects and Methods: Research design:** A descriptive cross-sectional methodological design was used. **Setting:** The study conducted at Technical Institutes of Nursing at Al- Sharkia governorate. **Subjects: sample** Two types of samples were utilized: 1) A convenient sample of 59 nurse educators in Technical Institutes of Nursing at Al-Sharkia governorate at the time of data collection and agrees to participate in the study and 2) a stratified proportionate random sample; the study sample included 415 students. **Tool of data collection:** Data was collected by two tools**: The first tool** was Questionnaire sheet for nursing students developed by **(Neshunzh, 2017)**, **the second tool** was Questionnaire sheet for nursing educators which developed by **(Burns, 2013**).Data were collected through self-administered questionnaires and analyzed using descriptive and inferential statistics. **Results:** (78.8%) of studied students passed, while (21.2%) of students failed, (57.1%) of the studied technical institute students had moderate level of factors contributing to academic failure with allover (Mean ±SD) score (123.37±22.92). As well, (57.6%) of studied educators had moderate perception level of factors contributing to academic failure with allover (Mean ±SD) score (75.44±13.58), there is no significant difference between throughput of technical institute' nurse students and their affiliation to Zagazig University or Ministry of Health, p>0.05. **Conclusion:** while over three-quarters of the studied nurse students successfully passed, more than half of the students exhibited a moderate level of factors contributing to academic failure with no significant difference regarding their affiliation to Zagazig University, the Ministry of Health, and Fakous technical institutes while over half of the studied nurse educators demonstrated a moderate perception of factors contributing to academic failure, Moreover, strategies were developed by the researcher to enhance throughput among technical nurse students in technical institutes of Nursing at AL- Sharkia governorate. **Recommendation:**The institutions should include the strategies that can enhance graduate throughput of student nurses. Nurse educators should use varied strategies in teaching to help students improving their academic performance ,also students should improve their studying habits, prioritize between their studies and social activities and to be responsible and effective time management especially male nurse students and seek help from nurse educators when having learning difficulties of hard lessons.

Keywords: Strategies, throughput, academic failure, Student nurse and nursing educator

Introduction

Nursing plays a critical and central role in global health systems, serving as the backbone of healthcare delivery and a primary driver for achieving universal health coverage and sustainable health outcomes. According to the State of the World's Nursing 2024 report published by the World Health Organization **(WHO)** in collaboration with global partners, the nursing workforce remains fundamental to meeting population health needs, with nurses constituting the largest proportion of the healthcare workforce worldwide and acting as frontline providers across primary, acute, and community care settings**,** without substantial investments in nursing education and training, many regions particularly low and middle-income countries will continue to experience severe workforce shortages that constrain progress toward Sustainable Development Goals, including universal health coverage **(WHO, 2024).**

Global nursing education fosters the competencies necessary for nurses to serve diverse populations effectively, engage in leadership and research, and adapt to evolving global health demands, reinforcing the profession's strategic contribution to health promotion and disease prevention at both community and system levels **(Stacciarini, 2024)**,Collectively, these global imperatives underscore that nursing is not only a care profession but a strategic investment in public health and socio-economic development, making the study of nursing education critically important for ensuring high-quality care and sustainable health outcomes across the world.

One of the critical indicators of effectiveness in nursing education is the concept of throughput, which refers to the rate at which students' progress through their programs and successfully complete them within the expected time frame, throughput is typically measured by retention, progression, graduation rates, and time to completion all of which reflect the educational system's ability to support students from enrolment to graduation. In the context of nursing education, strong throughput rates are essential not only because they ensure a steady supply of qualified nurses to meet global healthcare demands but also because they signal the quality and responsiveness of educational programs to student needs and challenges **(Phillips et al., 2022).**

Strategies to enhance throughput among students can be broadly categorized into individual-based and institutional-based approaches. At the individual level, developing effective coping mechanisms such as problem-solving skills, emotional regulation, and resilience training has been shown to significantly improve academic performance. Additionally, time management and self-regulated learning strategies enable students to prioritize tasks, manage workload efficiently, and maintain a balance between academic and personal life (**Labrague, 2023; Mohammed et al., 2024).** On the institutional level, supportive learning environments, mentorship programs, and accessible counseling services play a crucial role in promoting student well-being. Providing continuous academic support further contribute to improved retention and progression rates **(Jafaru & Afolabi, 2023; Richardson et al., 2023).**

Enhancing throughput among student nurses requires the implementation of comprehensive, evidence-based strategies that address both academic and non-academic factors influencing student progression and retention. Recent studies emphasize that structured academic support, including tutoring, remediation sessions, and continuous assessment systems, plays a significant role in improving student success and reducing attrition rates. For example, structured assessment models and targeted remediation have been shown to increase student engagement, confidence, and retention in early nursing education **(Park et al., 2022).**

In addition, mentorship programs and academic advising particularly when individualized and proactive help identify at-risk students early and provide tailored support, thereby improving progression and completion rates **(Sheikoleslami et al., 2024).** Furthermore, curriculum enhancement strategies such as integrating time management, critical thinking, and study skills into nursing programs contribute significantly to academic success and throughput **(Kim et al.,2023).** Beyond academic interventions, fostering a supportive learning environment through peer support, psychological services, and social

integration has been identified as a key factor in sustaining student engagement and persistence. Evidence suggests that students who receive academic and emotional support are significantly more likely to remain in their programs and achieve timely graduation **(Teaching and Learning in Nursing, 2023).**

Significance of the study: The quality of education and patient care is revealed by good performance of nursing students during the academic and training period; recent years there are a great change in higher education as quality and accreditation which require high level of performance according to standard. Finally, the study will add new insight and knowledge on the factors that influence students through-put, more ever it will provide an opportunity for student nurses who repeated any level of study to improve their academic performance and increase pass rate. Thus, the current study was conducted to develop strategies to enhance throughput of technical nurse students at Al-Sharkia governorate**,** Egypt.Therefore, our study aimed to develop strategies to enhance throughput among technical nursing students at Al- Sharkia Governorate

Methods

Study Design

A descriptive cross-sectional methodological design was utilized.) was used to achieve the aim of the current study.

Study Setting

- The study was conducted in Technical Institutes of Nursing at Al-Sharkia governorate, Egypt (Technical Institutes of Nursing, Zagazig University, Technical Institute of Nursing, Fakous Branch. and Zagazig Technical Health Institute of Nursing).

Sample

Two types of samples were utilized: 1) A convenient sample of 59 nurse educators in Technical Institutes of Nursing at Al-Sharkia governorate at the time of data collection and 2) a stratified proportionate random sample of 415 students and met the following inclusion criteria: Students with low grades and poor performance in academics and volunteered students to respective the study

Exclusion criteria:

- Nurse educators who have experience less than one year.
- Nursing educators with diploma in Nursing Education.
- Students who refused to participate in the study.
- Students with chronic disease because their psychological state may affect negatively on the result of the study.

Tools of data collection: Two tools were used for data collection in order to achieve the goals of this study:

- **Tool I: Questionnaire sheet for nursing students**: A Questionnaire sheet comprised of three sections with 73 close-ended questions four-point likert- scales were used for data collection in the study.

Section I: Demographic data for student nurses consisting of 13 items as : age and gender, Pre education school, level of training, With whom do you live, Child care responsible, Current job, Study period/day/hr, Education period/week/hr, Practical period/week/hr, Sleep period/day/hr, , levels repeated by student nurses, subjects repeated by student nurses**.**

Section II: Factors contributing to academic failure related to student nurses consisting of 51 items grouped under five dimensions: mentoring and guidance by nurse educators (31 items),accompaniment in clinical areas(6 items) , guidance and coaching(8 items), supervision(2items),and student counseling empowerment and support(4 items).

Scoring system:

Student nurses' responses were measured on a four-point Likert scale where 1 represented strongly agree and 4 represented strongly disagree. The total score for this tool falls between 1 and 4. A low level of factors contributing to academic failure related to students is indicated by an interval between1and 2.5, a moderate level of factors contributing to academic failure related to students is indicated by an interval between2.51 and 3.27, and a high level of factors contributing to academic failure related to students is indicated by an interval between3.28 and 4.

Section III: Factors contributing to academic failure related to resources and equipment consisting of 9 items.

Scoring system: Student nurses' responses were measured on a four-point Likert scale where 1 represented strongly agree and 4 represented strongly disagree. The total score for this tool falls between 1 and 4. A low level of factors contributing to academic failure related to resources and equipment is indicated by an interval between1and 2.5, a moderate level of factors contributing to academic failure related to resources and equipment is indicated by an interval between2.51 and 3.27, and a high level of factors contributing to academic failure related to resources and equipment is indicated by an interval between3.28 and 4.

- **Tool II: Questionnaire sheet for nursing educators**: A Questionnaire sheet developed by **(Burns, 2013)** used to assess factors affecting student's throughput related to nursing educators**,** it comprised of three parts with 53 close-ended questions four-point likert- scales were used for data collection in the study.
- **Section I:** Demographic data consisting of 9 items e.g. (age and gender, Highest Qualifications, Position, Level of facilitation by nurse educators**,** Years of teaching experience, Years of nurse educators' lecturing experience, Subject currently facilitated).

Section II: Factors contributing to academic failure as perceived by nurse educators' consisting of 34 items grouped under five dimensions: Empowerment and support by management (20 items), Student co-operation (4 items), accompaniment in practical area (4 items), theoretical area (4 items), workload and shortage of nurse educators (2 items).

Scoring system: Nurse Educators' responses were measured on a four-point Likert scales ranging from strongly agree (1) to strongly disagree (4). The total level of score ranges from1 to 4. A low level of factors contributing to academic failure related to nurse educators is indicated by an interval between between1and2.51, a moderate level of factors contributing to academic failure related to nurse educators is indicated by an interval between 2.52and3.27, and a high level of factors contributing to academic failure related to nurse educators is indicated by an interval between 3.28and4.

Section III: Factors contributing to academic failure related to resources and equipment consisting of 10 items.

Scoring system: Nurse Educators' responses were measured on a four-point Likert scales ranging from strongly agree (1) to strongly disagree (4). The total level of score ranges from1 to 4. A low level of factors contributing to academic failure related to resources and equipment is indicated by an interval between1and2.51, a moderate level of factors contributing to academic failure related to nurse educators is indicated by an interval between 2.52and3.27, and a high level of factors contributing to academic failure related to nurse educators is indicated by an interval between 3.28and4.

Validity of the tools:

Five experts from nursing faculty at Zagazig University evaluated the questionnaire's face validity and content after it had been translated into Arabic. In addition to providing input on the tool, experts were requested to provide their opinions and suggest any features that should be added or removed. Based on their evaluations, the researcher implemented all recommended modifications. The reliability of the instruments was assessed using the Cronbach's Alpha coefficient, which measures internal consistency.

It was 0.940on factors contributing to academic failure related to student nurses scale and 0.891on factors contributing to academic failure related to resources and equipment scale regarding by student nurses and 0.816 on factors contributing to academic failure related to nurse educators scale and 0.827 on factors contributing to academic failure related to resources and equipment scale regarding by nurse educators.

Pilot study: A pilot study was conducted after tool validation and before the commencement of actual data collection to assess clarity, feasibility, and applicability of the study tools and to identify potential obstacles. Ten percent of the study participants (6 educators and 45 student nurses) participated in a pilot study. According to the pilot study results, the time needed to fill in the tools was about 15-20 minutes. Each participant received a copy of the study tools along with a brief explanation of the study purpose. The average time required to complete the tools ranged from 15-20 minutes. The subjects who participated in the pilot study were included in the study sample.

Field work:

The preparatory phase was done by printing questionnaire forms. The researcher met with the managers of the three selected institutes and explained the study objective and procedures then permission to continue the study was given. One nurse educator from each institute assisted as a mediator with arranging the place for respondents and distribution of questionnaires. Data was collected two days per week (Monday and Wednesday). The questionnaire sheet was distributed during break time and between lectures in class rooms or at the end of the day, time taken for completion of questionnaires was 15-20 minutes. Student nurses from level I and level II completed questionnaires in November 2021 and nurse educators in December 2021. All the completed questionnaires from the student nurses and nurse educators were submitted to the statistician for analysis. Questionnaires from the student nurses and nurse educators were coded and analyzed separately.

Administration and ethical consideration:

First, the study proposal was accepted by the Zagazig University Faculty of Nursing's Post Graduate Committee and Research Ethics Committee (REC) with the code of M.D.ZU.NUR\123\15\07\2020. Before starting any step in the study, an official letter containing the aim and nature of the study was issued from the Dean of the Faculty of Nursing at Zagazig University to the directors of two technical institutes of nursing at Zagazig University and technical health institute of nursing. Accordingly, approvals to conduct study were obtained. Subjects' voluntary participation was confirmed and is assured that the information would be kept confidential and used only for the study. Clear instruction on how to complete the scales were given to facilitate the role of the researcher. The collected data and information were confidential and were used only for the purpose of the study.

Statistical analysis:

All data were collected, tabulated and statistically analyzed using the IBM SPSS (Statistical Package for the social sciences) statistics for windows, version 23.0 IBM Corp., Armonk, NY: USA. Quantitative data were expressed as the mean ± SD &median (range), and qualitative data were expressed as absolute frequencies (number) & relative frequencies (percentage). Percent of categorical variables were compared using Chi-square test. Pearson' correlation coefficient was calculated to assess relationship between various study variables, (+) sign indicate direct correlation & (-) sign indicate inverse correlation, also values near to 1 indicate strong correlation & values near 0 indicate weak correlation. Logistic regression analysis was used to measure the association between dependent variables and independent variable using odds Ratio, (ORs), .Multiple linear regression is used to describe data and to explain the relationship between one dependent continues variable and one or more independent variables .All tests were two sided. p- Value < 0.05 was considered statistically significant, p and p-value ≥ 0.05 was considered statistically insignificant (NS).

The Spearman's correlation coefficient was calculated to assess the relationship between the research variables that are not regularly distributed. Strong correlation is indicated by a value near 1, weak correlation by a value near 0, direct correlation by a (+) sign, and inverse correlation by a (-) sign. Multiple linear regression is a form of predictive analysis. Multiple linear regression can be used to describe data and explain the relationship between one or more independent variables and one or more dependent variables. There were two sides to every test. P-values were classified as statistically significant if they were less than 0.05 and as statistically insignificant if they were more than 0.05.

Results

Table (1) indicates that 95.4% of nurse' students age less than 20years. The study found that the majority (91.8%) of them were females. Regarding pre education, more than one half from secondary school (54%), near of two thirds of them in level (1) .Almost of technical institute nurse' students living with family (97.3%), near one tenth 9.9%attained current job, education period/week/hr was ranged (11-15 hours) in 32.8 % of students, while practical period/week/hr was ranged (11-15 hours) in 33 % of students. The average sleep period/day/hr was ranged (5-7 hours) in 55.4 % of students.

Figure (1): Showed that frequency of studied technical institute students according to factors contributing to academic failure, low level (12.3%), moderate level 57.1% and 30.6% high level.

Figure (2): Showed that Frequency of studied technical institute students according to distribution of availability resources and equipment level, low level (29.2%), moderate level and 41.4% high level 29.4%.

Figure (3): This figure showed That, percent of passed was (78.8%) among technical nurse students and 21.2% of them failed.

Table (2): This table showed that student throughput is significantly influenced by factors contributing to academic failure and shortage in resources and equipment, $p<0.05$. While there was a significant inverse relation between factors contributes to academic failure and academic stress also there was a significant inverse relation between shortage resources equipment and academic stress, $p<0.05$. Moreover, throughput demonstrates a significant inverse relation with academic stress, $p<0.05$.

Table (3): This table revealed that about one half of technical institute' educators age less than <35 years (49.2%) ranged from 25-45 years old with mean±SD 34.4±5.34. All of them were females. Regarding Qualification, slightly more than one quarter had Bachelor's degree (25.4%), near of two fifths of them Master degree or Doctorate degree (37.3%). About two fifths (44.1%) of educators have experience years from (5-10). about one half (52.5%) of technical institute' educators for level I, facilitation two subjects 57.6 %, while practical responsible were 32.2 %. insufficient salary was reported by 67.8% of educators.

Table (4): This table showed that significant predictors for failure among technical nurse students were males , pre education was secondary school, decrease study period, decrease education period/week/hr, decrease practical period/week/hr, factors contributing to academic failure related to students, and unavailability of resources equipment, increase academic stress and factors contributing to academic failure related to educators.

Table (5): This table illustrates that there is no significant difference between throughput of technical institute' nurse students and their affiliation to Zagazig University or Ministry of Health, $p>0.05$.

Table (1): Frequency and Percentage Distribution of the technical institute nurse' students according to personal and educational hours, life style parameters (n=415)

Variables	NO.	%
Age per years		
▪ ≥20 years	19	4.6
▪ <20 years	396	95.4
▪ mean±SD	19.48±0.59	
▪ median(range)	20(18-21)	
Gender		
▪ males	34	8.2
▪ females	381	91.8
Pre education		
▪ Secondary school	224	54.0
▪ Nursing school	191	46.0
Current education _level		
▪ Level I	246	59.3
▪ Level 2	169	40.7
living state		
▪ with family	404	97.3
▪ Alone	11	2.7
Current job		
▪ no	374	90.1
▪ yes	41	9.9
Study period/day/hr		
▪ ≤1 hour	22	5.3
▪ 2-4 hours	66	15.9
▪ 5-6 hours	300	72.3
▪ ≥7 hours	27	6.5
Education period/week/hr		
▪ <10 hours	88	21.2
▪ 11-15 hours	136	32.8
▪ 16-20 hours	100	24.1
▪ 21-25 hours	91	21.9
Practical period/week/hr		
▪ <10 hours	89	21.4
▪ 11-15 hours	137	33.0
▪ 16-20 hours	99	23.9
▪ 21-25 hours	90	21.7
Sleep period/day/hr		
▪ <4 hours	51	12.3
▪ 5-7 hours	230	55.4
▪ 8-10 hours	134	32.3

Table (2): Personal characteristics and data of the nurse educators of technical institutes (n=59)

Variables	n	%
Age per years		
▪ <35 years	29	49.2
▪ ≥35 years	30	50.8
▪ Mean ±SD	34.4±5.34	
▪ Median (range)	35(25-45)	
Gender		
▪ Female	59	100.0
Qualification		
▪ Bachelors	15	25.4
▪ Master degree	22	37.3
▪ Doctorate degree	22	37.3
experience		
▪ ≤5 years	11	18.6
▪ 5-10 years	26	44.1
▪ >10years	22	37.3
Mean ±SD		
Median (range)	10.25±3.49	
	10(1-15)	
facilitation level		
▪ Level I	31	52.5
▪ Level II	28	47.5
Number facilitation Subject		
▪ one	25	42.4
▪ two	34	57.6
practical responsible		
▪ no	40	67.8
▪ yes	19	32.2
salary		
▪ Enough	19	32.2
▪ not sufficient	40	67.8

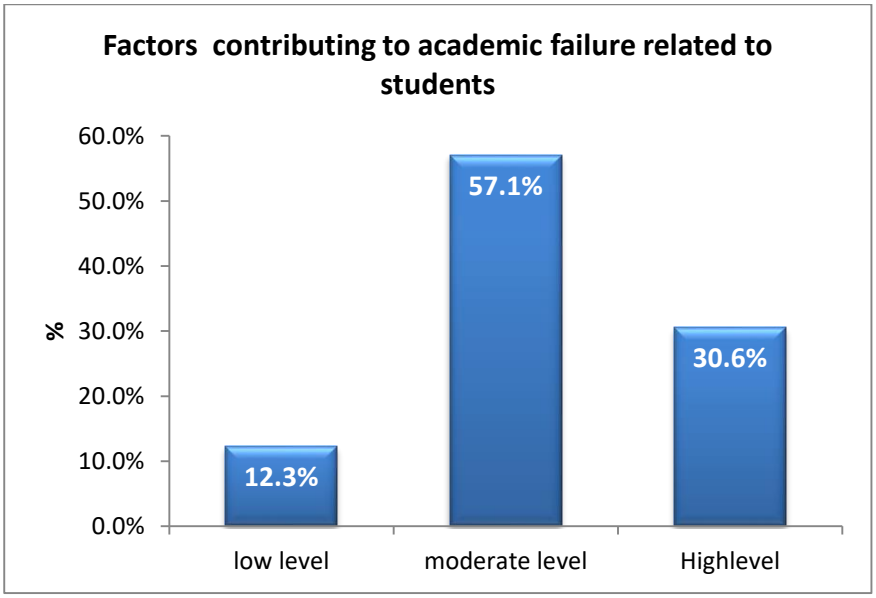

Figure (1) Factors contributing to academic failure related to students (N=415)

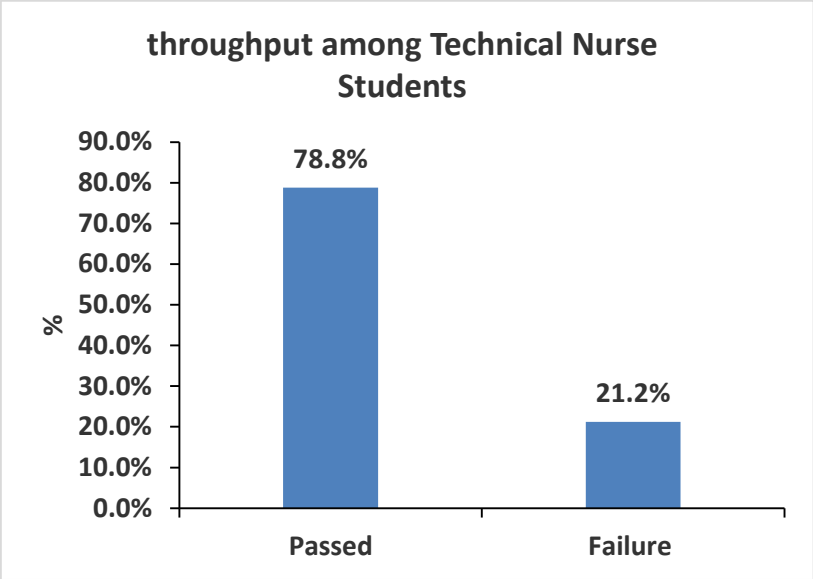

Figure (2) Throughput among Technical Nurse Students (N=415)

Table (3) Correlation matrix between factors contributes to academic failure, availability to resources and equipment related to nurse students in technical institutes (n=415):

variables	Factors contributes to academic failure		availability to resources and equipment	
	r	p	r	p
▪ Factors contributes to academic failure	1			
▪ availability to resources and equipment	0.59	0.0001	1	

Table (4): Logistic regression for predictors variables for failure among technical nurse students (n=415).

predictors	B	Sig.	Exp(B)	95% C.I.for EXP(B)	
				Lower	Upper
▪ Gender(males)	1.203	**0.001**	3.331	1.616	6.867
▪ Pre education(secondary school)	0.692	**0.006**	1.997	1.218	3.275
▪ Study period/day/hr	-1.387	**0.0001**	0.250	0.169	0.370
▪ Education period/week/hr	-0.608	**0.0001**	0.544	0.424	0.699
▪ Practical period/week/hr	-0.256	**0.029**	0.774	0.616	0.974
▪ Factors contributing to academic failure related to students	-0.036	**0.0001**	0.965	0.953	0.977
▪ Factors related to material resources and equipment in view of students	-0.222	**0.0001**	0.801	0.761	0.844
▪ Academic Stress score	0.028	**0.005**	1.028	1.008	1.049
▪ Factors contributing to academic failure related to educators	-0.135	**0.004**	0.874	0.797	0.958
▪ Factors related to material resources and equipment in view of educators	-0.082	0.099	0.922	0.836	1.015

Table (5): Relation between Throughput outcome and technical institutes (n=415):

Technical institutes	Throughput outcome				n.	χ^2	p-value
	Failed 88		Passed 327				
	No.	%	No.	%			
▪ Zagazig technical institute'	37	20.0	148	80.0	185	2.36	0.31
▪ Health technical institute'	39	20.4	152	79.6	191		
▪ Fakous technical institute'	12	30.8	27	69.2	39		

DISCUSSION

Throughput of Student Nurses: According to the present study findings, almost one fifth of the technical institute nurses' students failed specially at level one with no significant difference between throughput among the three technical institutes. Conversely, **El-awady etal (2022)** who stated that around half of the study subjects had an excellent score, while more than one fourth of them had very good, very small percentage of nursing students scored good and one fifth of them had pass score and no one failed.

In the present study, failure was common in general nursing science, followed by community nursing and biological natural science (anatomy and physiology). These findings comes in partial agreement with **Dorothy etal (2023)** who revealed that general nursing science was the most repeated subject, biological and natural sciences in more than one third of students followed by psychiatry nursing science and social sciences in almost one fourth of students, then community nursing science and midwifery science was the least failed subjects.

Concerning relation between throughput outcome and technical nurse students mentoring and guidance by nurse educators level, accompaniment in clinical area level, mentoring and guidance level, counseling support Level and academic failure related to student, the present study approved significant relation as well as **Gemuhay etal (2023)** who revealed that the higher the mentoring and guidance level, accompaniment in clinical area level, mentoring and guidance level and counseling support Level, the higher success rate of students.

Regarding factors contributing to academic failure related to nurse educators was moderate in more than half of the nurse educators and is considered a significant predictor of student failure. Also, **Fath-Elbab etal (2020)** revealed that there were positive significant correlation between nursing student clinical competence and nurse educator's empowerment at the studied Nursing Technical Institutes. Regarding relation between throughput outcome level and resources and equipment availability in technical institute**,** the present study found significant relation. In the same line, **Alshammari etal (2021)** concluded that low level of resources and equipment availability were associated with high percent of students failure. In agreement with the present study, **Flifel etal (2022)** confirmed that the vast majority of the nurse educators stated that the clinical lab is not suitable due to insufficient lighting and ventilation and there is a lack of lab resources as models, lack of library facilities as books and references, lack of guidance for students by library personnel, inadequate time and space for students to read. Also, the space between seats in the classrooms is not enough, and there is a lack of resources and physical facilities.

Conclusion

In conclusion, while over three-quarters of the studied nurse students successfully passed, more than half of the students exhibited a moderate level of factors contributing to academic failure with no significant difference regarding their affiliation to Zagazig University, the Ministry of Health, and Fakous technical institutes while over half of the studied nurse educators demonstrated a moderate perception of factors contributing to academic failure. Additionally, there was a significant direct relation between factors contributing to academic failure and the availability of resources and equipment. Moreover, strategies were developed by the researcher to enhance throughput among technical nurse students in technical institutes of Nursing at AL- Sharkia Governorate.

Recommendation:

Based on the findings of this study, the nurse educator need to:

- Implement diverse, student-centered teaching strategies to enhance engagement, understanding and academic performance.
- Strengthen academic and clinical supervision through continuous feedback and mentorship.
- Foster positive educator student relationships to identify and support at-risk students early.
- Participate in continuous professional development programs to improve teaching competencies.

The Student Nurses need to:

- Improve their studying habits; regularly attend theoretical and practical classes and effective time management especially male nurse students.
- Prioritize academic responsibilities over social activities and to be responsible.
- Seek academic, psychological, and counseling support when needed.
- Develop self-directed learning skills and intrinsic motivation.

Technical institutes of Nursing Managers need to:

- Provide modern teaching facilities, including high-speed internet, updated library collections, data projectors, and sufficient clinical models.
- Increase the hours and quality of clinical accompaniment by nurse educators to bridge the gap between theory and practice.
- Increase staffing of qualified nurse educators to reduce workload and overcrowding.
- Provide continuous professional development programs and workshops for educators.

Author's Contributions

The study's idea and design, data gathering, data analysis, and paper writing were all done by A.G.S. E.I.A.; assisted in designing the strategy, managed and supervised the project, and edited the manuscript. M.A.G. conducted the overall supervision, reviewed the manuscript, and took part in every stage of research. Every author contributed, edited, and approved the final manuscript.

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Declaration of conflicting interests

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