Problem-Based Learning Strategy Effect on Nurses' Knowledge and Patients' Health Behaviour Outcomes Post Myringoplasty

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Abstract

Myringoplasty is a repair of tympanic membrane perforation to restore and improve hearing function. Health belief model (HBM) is the suggested tool to measure the effect of post-operative instructions using problem-based learning strategy on patients' to maintain hearing and health behaviour. A well prepared nursing staff provides long lasting instructions for patients. The study aimed to evaluate the effect of problem-based learning strategy on nurses' knowledge and patients' health behaviour outcomes post myringoplasty. Research design: A quasi-experimental research design was utilized to meet the aim of this study. Setting: The study was conducted in Aswan University Hospital at the Department of Ear Nose and Throat. Sample: all available nurses (30 nurses) who have been working in the study setting, and 60 adult patients admitted at the time of the data collection were included in the study setting. Three tools were used for data collection, tool (1): Assessment of nurses' knowledge sheet developed by the researcher, and tool (2): HBM sheet according to Ruba etal. (2016), tool (3): assessment of patient complications sheet developed by the researcher. Results: in the present study, findings significant correlation of pre-operative nurses knowledge related to pre and post learning strategy P-value < 0.05. In addition there were a highly significant correlation of post-operative nurses knowledge related to pre and post learning strategy P-value< 0.001. As regard to health belief model there was significant correlation between pre learning strategy, post one month & after three months of post-operative instructions, in relation to HBM. Conclusion: Nurses' knowledge and skills differed with respect to the mean score. Introducing of problem-based learning strategy and hand out booklet were effective in improving the level of nurses' knowledge regarding post-operative instructions of patients with myringoplasty. Notably it revealed that, satisfactory patients' outcomes post applying the strategy in relation to HBM. Recommendations: All nurses should be aware by instructions that given to patients' pre discharge and inform patients about them.

Keywords: problem-based learning strategy, complications, myringoplasty, Health Belief Model.

1. Introduction

Myringoplasty is a surgical operation performed for reconstruction of tympanic membrane perforation when there is no ossicular damage. The causes of tympanic membrane perforation are chronic suppurative otitis media, surgery to place ear tubes or trauma. Myringoplasty can be performed under general anesthesia. The goal of this surgical procedure is for closure of perforation and to improve hearing (Chandran et al. 2014; Batni & Goyal 2015).

Patients' need for myringoplasty should be estimated through comprehensive history and physical checks include: perforation duration, severity of pain, otorrhea, level of hearing impairment or loss, vertigo, the history of past attempts of repair, otitis media, and otitis externa. The number and frequency of infections and time of recent infection that provide insight into the severity of disease should be evident (Downey et al. 2003; Reilly & Meyers 2016).

Complications are a common problem in low socioeconomic societies due to infection, lack of knowledge, and absence of well-defined care plan (Olusanya et al. 2014). Instruct the patient about the most common complications post-surgery such as, bleeding from the ear, infection in the graft, and reactions to medications. Other complications are damage to the facial nerve, hearing loss, dizziness or vertigo, incomplete healing of the graft, worsening of hearing, in rare cases, complete loss of hearing (Uzun &Velepic 2003).

Prevalence of hearing impairment for Middle East and North Africa for adults is 4% while for children is 1%. Degrees of impairment are: about 8.5% slight, 2.5% moderate, 0.25% severe and 0.1% profound (WHO 2012). The prevalence in Egypt was 16.0%. The highest prevalence (49.3%) was for people had 65 years or more (Abdel-Hamid et al. 2007).

Learning strategies are varies among which trainer can use the most appropriate strategy for improvement of learning for patient post ear surgery. Wisdom is to choose the suitable strategies which make training active, attractive and effective for nurses (Xu 2016). For maintaining hearing health, efforts should be made through providing further education for specialist health care personnel, convince public to change health related beliefs, habits and behaviours (WHO 2017).

Problem based learning is suggested for maintaining nurses knowledge, exchange of experience,

enhancement of cooperation and interaction of learners, as well as improving nursing practical skills. Problem based learning fosters high quality learning speed and efficiency of clinical reasoning through placement of learning in a functional context (Hamdan et al. 2014; Ku & Ha 2016).

Health belief model (HBM) application to hearing health behaviour helps to explain and predict health-related behaviours (Saunders et al. 2013). The model allows for recognition of health problems, the need for care and prevention that will lead to change of patient's habits post ear surgery (Wagner et al. 2017). It expresses the patients' beliefs about health problems; perceived benefits of action and barriers to action; and self-efficacy explain engagement or lack of engagement, in health-promoting behaviour (Ruba et al. 2016).

2. Aim of the study:
Evaluate the effect of problem-based learning strategy on nurses' knowledge and patients' health behaviour outcomes post myringoplasty.

3. Significant of the study
Patients post myringoplasty express many problems which affect patients' prognosis in relation to lack of nurses' instructions for patients' post-operative. Therefore, this study aimed to investigate the effectiveness of problem-based learning strategy on nurses' knowledge level and patients. That will be reflected on patients' behaviour outcomes post myringoplasty which evaluated by health belief model, to reduce the incidence of postoperative complications.

4. Research hypothesis:
H1. Nurses exposed to problem-based learning strategy are efficient to introduce post-operative instructions for patients' post myringoplasty.
H2. There was change in patients' behaviour resulting in positive effect on patients outcomes post myringoplasty.

5. Subjects and Methods
5.1 Research design
A quasi-experimental research design was utilized to meet the aim of this study.

5.2 Setting:
The study was conducted in Aswan University Hospital at the department of Ear Nose and Throat.

5.3 Sample:
Convenience samples of two groups were included to collect data in the study:
- Group I, nurses: all available nurses (30 nurses) who have been working in the department of Ear Nose and Throat were included in the study.
- Group II, patients: sixty adult males and females patients were selected from the above mentioned setting, using scoring Epi Info program to detect sample size equal 60 at power study 80% Confidence Interval CI 95% P>5. Then, according to the following inclusion criteria: adult patients, able to communicate, willing to participate in the study.

5.4 Tools of data collection:
Three tools were used for data collection:
- First tool: two parts nurses' knowledge structure interview questionnaire: it was designed by the researcher based on current and international literature to assess nurses' knowledge regarding patients' health behaviours and outcomes post myringoplasty.
  - Part 1: Socio-demographic characteristics of nurses namely: age, sex, educational level, years of experience, and marital status.
  - Part II: Assessment of nurses' knowledge: it is a three points Likert scale to assess nurses knowledge for myringoplasty pre and post applying problem-based learning strategy in the following dimensions:
  a) Pre-operative: included the theoretical background about the anatomy and physiology of the ear, causes of ear perforation, the risk of perforation of the eardrum, and surgical operation.
  b) Post-operative nurses knowledge about:
    - General precautions for patient safety and prevention of infection, signs and symptoms of infection, keep the ear and all incisions clean and dry after the surgery, and sings of complication post-surgery (Reilly & Meyers 2016)
    - Physical activity precautions as: elevate the head of the bed, limit all activities, no heavy lifting, and no exertion. Do not blow nose for at least two weeks following the surgery,

avoid swimming for six weeks following the surgery, avoid airplane travel for six weeks after the surgery, take time to retain work, avoid smoking, and sneeze/cough with open mouth (Oshima 2002).

  ▪ Nutrition precaution: diet in the first day post-operative, avoid food that causes vomiting and nutrition at home.

- Scoring system: The total score of questionnaire is 114 grades, answer by no knowledge, need help, and complete knowledge, started from zero grade to two. Less than 68.4 (60%) considered having poor knowledge level. These who obtain (60%) were considered having satisfactory level of knowledge and above were considered having good level of knowledge.

• Second tool: This tool based on the Health Belief Model according to Ruba etal. (2016) the researcher interviewed the myringoplasty patient's pre and post application of problem-based learning strategy by nurses. The tool consisted of two parts:

- Part 1: Socio-demographic variables and medical history: name, age, sex, level of education, marital status, occupational status, socioeconomic status, causes of perforation, duration of perforation, smoking, and hygiene.

- Part II: HBM components includes: psychological status, competency to engage in self-care, patient perceptions, cost benefit, modifying factors, cues to action, social support, self-concept and physiological adaptation. The score of yes = "1" means satisfactory response to the listed statement and no score = "0" means unsatisfactory response.

• Third tool: complication assessment sheet: this sheet was developed by the researcher to list complications developed for patients post myringoplasty. It consisted of (8) criteria (items) under main three headings that covered all post myringoplasty complications as: ear infection, otitis media, other head and neck inflammation. The possible complication was Yes and No, the score of Yes = "1" means satisfactory outcome and No score = "0" means unsatisfactory outcome.

5.5 Method:

This study was carried out in three phases:

• Assessment and planning phase: This phase included the following: reviewing the available literature and different studies related to research problem, and theoretical knowledge of its various aspects of the study. This period extended from May to December (2016).

• Ethical considerations: informed consent was obtained from nurses and patients who are willing to participate in the study after explanation of the nature and purpose of the study. Confidentiality of the study population was certainly assured.

• Implementation phase: the process of data collection was carried out from middle of August 2015 to the end of March 2016. The implementation phase was achieved through:

- Validity was tested through jury of 4 experts in the field of medical surgical nursing and 2 medicine experts in the field of otology. Reliability of proposed tools was done by Cronbach's alpha test it was 0.844, the developed tools was tested using test retest method within 2 weeks. A pilot study it was carried out on 10% of the study population, who were excluded from the main study sample. The pilot study was done to ensure clarity, applicability, feasibility of conduction of the study tools, and time needed for each tool to be filled in. Needed modifications according to the pilot study findings were done, so some items were omitted, added or rephrased, and then the final forms were developed.

- Problem-based learning strategy was based on questions concerning the scientific content to be introduced to nurses by the researcher. Nurses had taken time to answer each question. Team cooperation for nurses' answers was allowed. After that scientific answer for each question was presented by the researcher through PowerPoint slide show. Nurses are given hand out of the scientific content of post-operative instructions to improve outcomes of patients' post myringoplasty.

- Total number of training hours for nurses were (45 hours) 10 hours for theoretical part, 35 hours for skills plus teaching on spot in addition to 4 sessions (10 hours) 5 hours for orientation at the learning strategies, and other (5 hours) at the end for revision.

- Total number of nurses was 30, they were divided into 6 groups each group included 5 nurses. Implementation took 16 weeks for all nurses in the study setting in morning, and afternoon shifts. After that, the researcher asked the staff nurses to implement the problem-based learning strategy while giving patients post-operative instructions, during their work at selected setting. Then, assess patients' complications and outcomes.

- The patients' participants were interviewed three times using HBM. The first interview was done before applying problem-based learning strategy on patients' post myringoplasty. The second

interview was done post one month of instructions. The third interview was done post three months to evaluate the outcome.

- Evaluation phase:
  - Nurses' satisfactory knowledge level and skills has been evaluated pre and post implementation of problem-based learning strategy, by the researcher through filling the nurses' knowledge structure interview questionnaire.
  - Patients' change in beliefs, behaviour and outcomes were assessed using Health Belief Model and complication sheet. Evaluation was done before, after one month, and then after three months of applying problem-based learning strategy for patients.

5.6 Administrative design:

An official letter was issued from the Dean of the Faculty of Nursing to the Head of Ear, Nous and Throat department at Aswan University Hospital to collect the necessary data. Explain the aim and contents of the study to nursing supervisors and physicians to gain their cooperation and allow the release of nurses to attend the education during minimal workload activities. Meetings with patients to explain the objectives, content of this study and to obtain informed consent was done.

5.7 Statistical Design:

The collected data were coded then transformed into specially designed form so as to be suitable for entering into IBM compatible computer. All entered data were verified for any errors using Statistical Package for Social Sciences (SPSS) version 17 for windows. Data were collected, tabulated and statistically analysed using frequencies & percentages, mean & stander deviation, Chi-square test, and T-test. Correlation coefficient (r) was calculated between continuous variables. Test of significance were considered as a follows:

- No significant   (NS) $P > 0.05$
- * Significant $P < 0.05$
- ** Highly significance $P<0.001$

6. Results

Table (1): Distribution of the study sample related to frequency and percentage of nurse's according to socio demographic characteristics (No= 30 nurses).

Item	No. = 30	%
o **Age**		
- *< 30*	15	**50.00**
- *30 - < 40*	11	36.67
- *40 and more*	4	13.33
o **Sex:**		
- *Male*	12	40.00
- *Female*	18	**60.00**
o **Education Level:**		
- *Master/Doctorate degree in nursing*	2	6.67
- *B. S .C nurse*	7	23.33
- *Associate degree in nursing*	14	**46.67**
- *Diploma of nursing school (3 years)*	7	23.33
o **Years of experience:**		
- *< 3 years*	17	**56.67**
- *3- <6 years*	8	26.67
- *6- <9 years*	1	3.33
- *≤ 9 years*	4	13.33
o **Marital status**		
- *Single*	22	**73.33**
- *Married*	5	16.67
- *Divorced*	1	3.33
- *Widow*	2	6.67

Insignificant P >0.05   *Significant P≤ 0.05   **Highly significant P<0.001

Table (1) Shows the socio-demographic data for studied nurses, the highest percentage of age was (50.00%) for age group < 30. More than half of them (60%) were females, (46.67%) had Associate degree in nursing, and (56.67%) had < 3 years of experience. In addition the majority of them (73.33%) were single.

Table (2): Distribution of the study sample related to comparison between means of nurses knowledge in relation to pre-post application of the learning strategy (No= 30 nurses).

Item	Pre- learning strategy No=30		Post- learning strategy No= 30		T-test	P-value
	No	%	No	%		
Pre-Operative Nurses knowledge about:						
Ear, causes & risk of eardrum perforation, and surgical operation						
• *Mean ±SD =*	15.8000±5.10363		19.2857±4.79933		**2.944**	**0.004***
Post-Operative Nurses knowledge about:						
General precautions for patient safety and prevention of infection						
• *Mean ±SD =*	41.4857±9.15992		55.9143±9.16955		**6.586**	**0.000****
Patient physical activity precautions						
• *Mean ±SD =*	14.7429±2.52450		20.4000±4.13877		**6.904**	**0.000****
Patient nutrition precautions						
• *Mean ±SD =*	6.2000±1.43075		9.0571±2.51984		**5.833**	**0.000****
Total mean ± SD	**78.22857±11.13205**		**104.657 ± 13.48189**		**8.992**	**0.000****

Insignificant P >0.05   *Significant P≤ 0.05   **Highly significant P<0.001

Table (2) Revealed that there was significant correlation between pre-operative nurses knowledge in relation to pre and post learning strategy P-value < 0.05. While there were a highly significant correlation between post-operative nurses knowledge in relation to pre and post learning strategy P-value < 0.001.

Table (3): Distribution of the study sample related to frequency and percentage of patient's according to socio demographic characteristic (No= 60 patients).

Item	No = 60	%
1. Age (years):		
▪ <20	7	11.9
▪ 20 - <30	21	**35.7**
▪ 30 - <40	16	27.2
▪ 40 - <50	5	8.5
▪ 50 - <60	8	13.6
▪ 60 and more	3	5.1
Mean +SD =	**33.3000± 12.86475**	
2. Gender:		
▪ Male	21	35.7
▪ Female	39	**66.3**
3. Education level:		
▪ Illiterate	10	17
▪ Preparatory	25	**42.5**
▪ Secondary school	17	28.9
▪ University	8	13.6
4. Occupation:		
▪ Employee	14	23.8
▪ Unemployed	41	**69.7**
▪ Skilled worker	5	8.5
5. Marital status:		
▪ Single	12	20.4
▪ Married	48	**81.6**
6. Socioeconomically status:		
▪ Poor	7	11.9
▪ Well	53	**90.1**

Insignificant P >0.05   *Significant P≤ 0.05   **Highly significant P<0.001

Table (3) Regarding to patient's socio demographic characteristic the table revealed that the age highest percentage was (35.7%) for age group (20 - <30), with mean age of (33.3000± 12.86475). About two thirds of

the sample (66.3%) were females. Approximately (42.5%) had preparatory education level. More than two thirds of them (69.7%) were unemployed. Most of them (81.6%) were married. The majority of them (90.1%) had well socioeconomically status.

Table (4): Frequency and percentage distribution of patient's study sample according to causes and duration of perforation (No= 60 patients).

Item	No = 60	%
Causes of perforation		
▪ Acute otitis media	58	**96.7**
▪ Trauma	2	3.3
Duration of perforation		
▪ < 1 year	2	3.3
▪ 1 - <5	17	28.3
▪ 5 - <10	19	**31.7**
▪ 10 - <15	11	18.3
▪ 15 and more	11	18.3

Table (4) Regarding causes of perforation the highest majority (96.7%) of the study sample had acute otitis media. Approximately (31.7%) of the sample had eardrum perforation for 5 - <10 years.
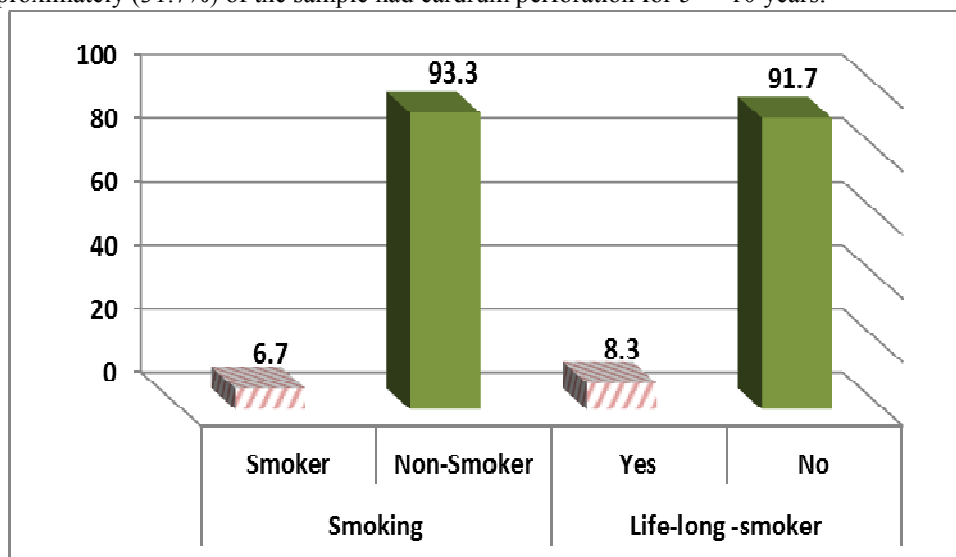

Figure (1): Distribution of patient's study sample according to smoking (No= 60 patients).

Figure (1) Depicts that the highest majority of the study sample (93.3%) were non-smokers, and (91.7%) were life-long-non-smokers.
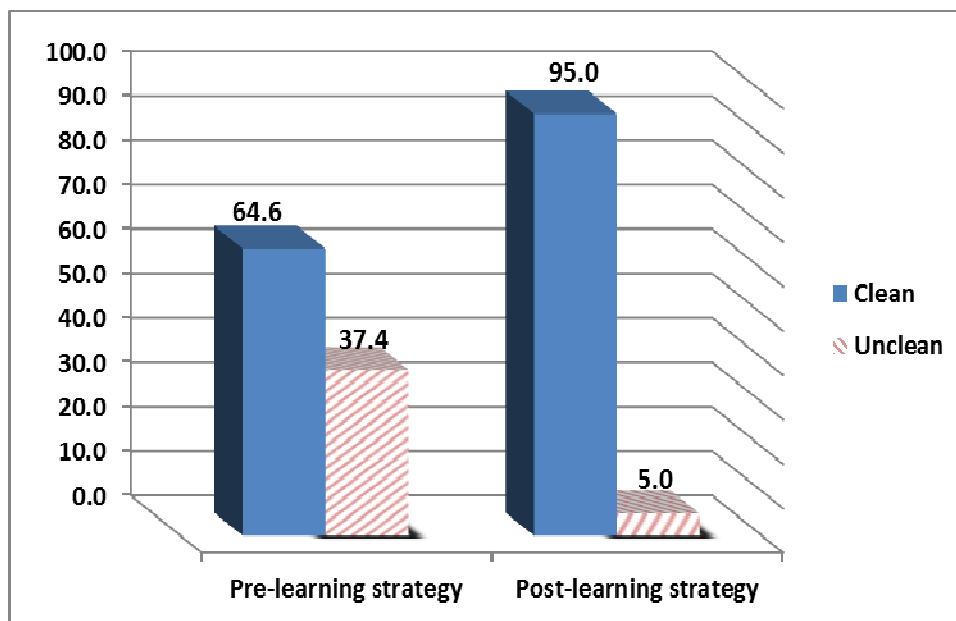
Figure (2): Distribution of patient's study sample according to hygienic care (No= 60 patients).

Figure (2) Delineate that hygienic care post learning strategy was improved (95.0%) for studied patients.

Table (5): Distribution of patient's study sample according to complications (No= 60 patients).

Item	Pre-learning strategy No= 60		Post-learning strategy No=60		X^2	P-value
	No	%	No	%		
Ear infection						
▪ Yes	22	36.7	12	20.0	**4.104**	**0.043***
▪ No	38	**63.3**	48	**80.0**		
Otitis media						
▪ Yes	9	15.0	2	3.3	**4.904**	**0.027***
▪ No	51	**85.0**	58	**96.7**		
Other head and neck inflammation						
▪ Yes	7	11.7	1	1.7	**4.821**	**0.028***
▪ No	53	**88.3**	59	**98.3**		

Insignificant P >0.05   *Significant P≤ 0.05   **Highly significant P<0.001

Table (5) Shows that for patient's complications there were significant correlation between pre-post learning strategy for ear infection X2 = 4.104 at P <0.05, otitis media X2 = 4.904 at P < 0.05, and other head and neck inflammation X2 = 4.821 at P <0.05.

Table (6): Distribution of patient's study sample according to Health Belief Model (No= 60 patients).

Item	Pre learning strategy No= 60		Post One month No=60		Post Three months No=60		X^2	P-value
	No	%	No	%	No	%		
Section: 1- Psychological status								
▪ Satisfactory	32	53.3	49	81.7	46	76.7	**13.211**	**0.001***
▪ Un-Satisfactory	28	46.7	11	18.3	14	23.3		
Section: 2- Competency to engage in self-care								
▪ Competent	37	62.9	51	86.7	49	81.7	**10.511**	**0.005***
▪ Not competent	23	39.1	9	15.3	11	18.3		
Section: 3- Patient perceptions								
Patient perceptions of disease susceptibility								
▪ Perceive	24	33.8	47	78.3	46	76.7	**24.762**	**0.000****
▪ Not perceive	36	73.5	13	21.7	14	23.3		
Patient perceptions of disease seriousness								
▪ Perceive	37	61.7	50	83.3	48	80.0	**8.117**	**0.013***
▪ Not perceive	23	38.3	10	16.7	12	20		
Patient perceptions of: Cost benefits								
▪ Perceive	28	46.7	47	78.3	46	76.7	**17. 297**	**0.000****
▪ Not perceive	32	53.3	13	21.7	14	23.3		
Section: 4- Modifying factors								
Relationship with provider								
▪ Satisfactory	17	28.3	50	83.3	46	76.7	**46.266**	**0.000****
▪ Un-satisfactory	43	71.7	10	16.7	14	23.3		
Provider continuity								
▪ Easy	30	50.0	45	75.0	43	71.7	**9.792**	**0.007***
▪ Difficult	30	50.0	15	25.0	17	28.3		
Section: 5- Cues to action								
▪ Present	43	71.7	53	88.3	50	83.3	**5.729**	**0.057***
▪ Not present	17	28.3	7	11.7	10	16.7		
Section: 6- Social support								
▪ Present	40	66.7	43	71.7	42	70.0	**0.367**	**0.833**
▪ Not present	20	33.3	17	28.3	18	30.0		
Section: 7- Self-concept								
▪ Present	38	63.3	52	86.7	50	83.3	**11.057**	**0.004***
▪ Not present	22	36.7	8	13.3	10	16.7		
Physiological adaptation								
▪ Adaptable	27	45.0	58	96.7	56	93.3	**59.116**	**0.000****
▪ Un-adaptable	33	55.0	2	3.3	4	6.7		
Total health belief model								
▪ Satisfactory	41	68.3	59	98.3	56	93.3	**26.827**	**0.000****
▪ Un-satisfactory	19	31.7	1	1.7	4	6.7		
Mean +SD of patient's positive response to health belief model	**32.09±7.77759**		**49.55±4.10764**		**47.45±3.8305**			

Insignificant P >0.05   *Significant P≤ 0.05   **Highly significant P<0.001

Table (6) Declares that there were significant correlation between pre learning strategy, post one month and post three months of the learning strategy for patients' psychological status 13.211 at P <0.05, competency to engage in self-care X2 = 10.511 at P <0.05, patient perceptions of disease seriousness X2 = 8.117 at P <0.05, provider continuity X2 = 9.792 at P <0.05, cues to action X2 = 5.729 at P <0.05, and self-concept X2 = 11.057 at P <0.05. In addition there were highly significant correlations for patient perceptions of disease susceptibility X2 = 24.762 at P < 0.001, patient perceptions of: cost benefits X2 = 17. 297 at P < 0.001, relationship with provider X2 = 46.266 at P < 0.001, and physiological adaptation X2 = 59.116 at P < 0.001.

Moreover there was highly significant correlation X2 = 26.827 at P < 0.001 for satisfactory result of total health belief model. Mean and Std. pre-learning strategy (32.09±7.77759), post-one month of learning strategy (49.55±4.10764), and after three months of the learning strategy (47.45±3.8305).

Table (7): Relation between nursing outcome and patients complications & health belief model post learning strategy (No= 60).

Item	Nurses Satisfactory		Nurses Unsatisfactory		X^2	P-value
	No	%	No	%		
Patients Complications						
▪ No	48	80.00	0	0.00	8.276	0.004*
▪ Yes	10	16.67	2	3.33		
Health belief model						
▪ Satisfactory	58	96.67	1	1.67	29.429	0.000**
▪ Un-satisfactory	0	0.00	1	1.67		

Insignificant P >0.05   *Significant P≤ 0.05   **Highly significant P<0.001

Table (7) Shows that for nurses satisfactory outcome in relation to patients complications post learning strategy (80.00%) of patients had no complications, in comparison to (3.33%) of patients had complications related to nurses had unsatisfactory outcome X2 = 8.276   at P<0.05. Regarding to nurses satisfactory outcome in relation to health belief model post program (96.67%) of patients had satisfactory behaviours according to health belief model, in comparison to (1.67%) of patients had un-satisfactory behaviours according to health belief model related to nurses had unsatisfactory outcome X2 = 29.429 at P<0.001.

7. Discussion

Myringoplasty is a surgery performed for repair and rebuilds the eardrum to restore hearing and remove infection from the ear. Patients' instructions should be carefully given to keep surgery site safe from infection and other complications. Use of HBM to assess patient health behaviour post myringoplasty after application of problem based learning strategy while providing post-operative instructions, help to detect barriers to caring, self-efficacy, and the ability to comply with hearing health behaviour for reduction of complications. Prepared staff for instruct patients through the problem based learning strategy is helpful to provide long lasting effect on patients' outcome.

The aim of the present study is to evaluate the effect of problem-based learning strategy on nurses' knowledge and patients' health behaviour outcomes post myringoplasty.

The current study findings revealed that the mean age of the study sample of nurses was about thirty three; the highest percentages of them were single, females, had more than three years of experience, with associate degree in nursing. Zhang (2014) agrees with the current study finding, the mean age was 27 years old, most of the study sample was females, and had a bachelor degree.

From the study findings there was significant correlation between pre-operative nurses knowledge in relation to pre and post learning strategy. Highly significant correlation was present between post-operatives nurses' knowledge in relation to pre and post learning strategy. Ended that nurses knowledge had been improved after the implementation of problem-based learning strategy. Reza et al. (2017) found that a great improvement in knowledge occur post implementation of designed program. Moreover Gönc et al. (2017) showed that problem-based learning enhanced nursing students' teamwork, motivation, and independence also it facilitate acquirement of knowledge with high quality nursing skills.

The study showed that; as regarding to age the highest percentage for age group was ranged from twenty to less than thirty years, about two thirds of the study sample was females. Approximately half of them had preparatory education level. More than two thirds of them were unemployed. Highest percentage of them was married. The majority of them had well socioeconomically status. Similar results were found, females were predominant over males (Naderpour et al. 2016). In the same line Indorewala (2015) found that more than half of the study sample were females. The patients age group ranged from twenty one to forty years was the most affected group.

The current study results revealed that acute otitis media had the highest percentage as cause of perforation. In addition the highest percentage for duration of eardrum perforation for patients lay in the category from under eaten years to long forty years. This agrees with Shetty (2012) who found that, eardrum perforations caused by otitis media are relatively permanent that indicate surgery.

Also, another opinion from Monasta et al. (2012) who reported that, the incidence rate of acute otitis media is about eleven percent per year more than half of cases occurring in preschool age. The incidence rate of chronic suppurative otitis media is about five per thousand with twenty two point six of cases occurring annually in under-eaten.

Acute otitis media was the major indication for surgery this condition constitutes a major public health problem in both children and adults, especially in the developing world (Adoga 2010).

The study depicts that, the highest majority of the study sample were non-smokers, and life-long-non-smokers. In the same line with Fukuchi et al. (2006) showed that, insignificant statistically correlation between

tympanic membrane perforations and smoking.

The current study revealed, improved hygienic care post implementation of learning strategy. As study by WHO (2006) showed that hearing impairment affects about two hundred and seventy eight million people around world. Developing countries have the highest percentage (more than sixty percent). Staff must be trained and be able to instruct people for how to do ear hygiene. This agrees with Mohamed & Shabaan (2015) who reported that, regarding hygienic care the majority of patients was unclean and had poor socioeconomic status. More than two thirds of them had otitis media and more than one third are smokers. The researcher recommended a training program to improve patient's behaviours and outcome.

These may be the causes of improved for competency to engage in self-care, patient perceptions of disease seriousness, provider continuity of care, cues to action, and self-concept. As they had the benefits of the effect of problem based learning strategy on nurses' knowledge and reflect on patients outcomes other than pre learning strategy.

Concerning pre and post problem-based learning strategy; the results revealed that, as regards patient's complications there were significant correlation between pre-post learning strategies for ear infection, otitis media, and other head and neck inflammation. A study by Biese (2014) found that patient instructions were positively correlated with improvement of complications. Also, another opinion from Lo (2009) who suggested that, written information explaining the post discharge plan of care improves patients' outcome.

From this it is seen that, there were significant correlation between pre-learning strategy, post one month, and post three months of applying problem-based learning strategy with HBM components. According to Vazini & Barati (2014) showed that HBM suggested about thirty percent of self-care behaviour. Patient behaviour can be improved through providing instructions while encouraging self-efficacy and avoiding barriers of preferred behaviour. Moreover Jalilian et al. (2012) who studied the application of the HBM found that it was highly effective for predicting self-care behaviour. Including Glanz et al. (2008) that reported self-efficacy as a predictive factor of self-care behaviour in patients post ear surgery.

The study shows that, there was significance correlation of nurses' outcome in relation to patients' complications post problem-based learning strategy. In addition, there was highly significance correlation between nurses' outcome in relation to patients' responses to HBM. So improvement of nurses' knowledge positively affects the quality of post-operative instruction of myringoplasty patients' as reflected by HBM. The finding agrees with Abdullah et al. (2017) who states that there was significant correlation between patient complication and nurses' knowledge. In the same line Zeigheimat (2016) declares that in relation to HBM knowledge of nurses can be improved and barriers to good behaviour can be reduced.

Finally, based on the study results, significant difference in patients' complications, and outcomes was compared by pre and post application of problem-based learning strategy. There was satisfactory correlation of nurses' outcome in relation to HBM and patients' complications, this result prompt for giving post-operative instructions using problem-based learning strategy.

8. Conclusion
Nurses' knowledge and skills differed with respect to the mean score. Introducing of problem-based learning strategy and hand out booklet were effective in improving the level of nurses' knowledge regarding post-operative instructions of patients with myringoplasty. Notably it revealed that, satisfactory patients' outcomes post applying the strategy in relation to HBM.

9. Recommendations
- All nurses should be aware by instructions that given to patients' pre discharged and inform patients about them.
- Reinforcement of post-operative instructions utilizing problem-based learning strategy concerning to the patients' needs.

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