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A study to assess the effectiveness of Self-instructional Module on knowledge regarding ABG among student nurses in selected college of city

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Abstract

Arterial blood gas analysis is a basic and useful laboratory test for the critical care of patient. ABG is an essential investigation for assessing clinical oxygenation and acid base status in critically ill patient, providing information about ventilation, oxygenation and acid base status, the three closely and interrelated physiological parameters that maintain pH homeostasis. Among student Nurses in selected college of city. An arterial blood Gas (ABG) tests explicitly blood taken from an artery ABG analysis assesses a patient's partial pressure of oxygen (PaO2) and carbon dioxide (PaCO2). The objectives of study were to assess existing level of knowledge regarding ABG analysis among the students nurses in selected college, Assess the post test knowledge regarding the ABG analysis among the student nurses in selected college, to assess the effectiveness of SIM on ABG analysis among the students nurses in Selected college, to find out the association between post-test levels of knowledge with selected Demographic level. A structured questionnaire to collect the knowledge score was use for data collection and the analysis was done with the help of inferential and descriptive statistics. The data collection was done from 60 samples from basic BSc nursing 3rd year students. The pre test shows 26.67% of the nursing student had poor level of knowledge score, 58.33% had average and 15% had good level of knowledge score. The post test shows 5% nursing student had average level of knowledge score 35% had good and 60% of nursing student have excellent level of knowledge score. The calculated t value is 15.07 are much higher than the tabulated value at 5% level of significance. Hence it is statistically interpreted that the self-instructional module on knowledge regarding ABG analysis among nursing students was effective

Keywords: ABG; PaO; PaCO2; SIM; HCO3; Arterial puncture

1. Introduction

Arterial blood gas are an important routine investigation to monitor the acid base imbalance of the patient. They may help to make diagnosis and indicate the severity of condition and help to assess treatment of the acute and chronic respiratory illness. Blood for ABG analysis can be obtain by arterial puncture usually from radial and femoral artery[1]. PH, PCO2, PaO2, bicarbonate, acid, base this are the main component of the ABG. Self-instructional module is one of the educational materials that help individualized learning to student regarding ABG.

The most imperative aspect of patients in emergency and critical care setting is their Dynamic physiological status and potential for rapid deterioration that may require early diagnosis and clinical decisions for better patient outcome including pre-hospital Medicine, using portable system for the correct diagnosis of the patient's conditions. Along with various" vital sign" such as ,blood pressure, heart rate and rhythm ,temperature ,and respiratory rate ,some biochemical markers reflect this rapid changes resulting in patients unstable physiology[2].

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Normal function of body cells depends on regulation of hydrogen (H+) concentration within very narrow limits. If the (H+) levels exceed these normal limits acid- base imbalance result and are recognized clinically as abnormalities of serum P(H) . Because of acid-base imbalance may be cause by disorder of any body system. There incidence in clinical settings is quite high. Arterial blood gas (ABG) among the parameters are P(H),PaCo2 and HCO3. These values may be used to determine the presence of acid base imbalances and evaluate the level of compensation. These disorder are not clinical diagnosis or disease in themselves rather, they are clinically syndromes .It is associated with wide variety of diseases [3].

Arterial blood gas(ABG) are frequently order by emergency Medicine, intensivist , Anesthesiology, and pulmonology clinicians but may also be needed in other clinical settings. It is merely a laboratory Finding. Many diseases are evaluated using an ABG, including acute respiratory distress syndrome (ARDS), severe sepsis, septic shock, hypovolemic shock, Diabetic ketoacidosis, renal tubular Acidosis, acute respiratory failure, cardiac arrest, asthma, and inborn errors of metabolism [4].

1.1. Need of the study

The collection of arterial blood by nurse is not only technically difficult, but can be painful and hazardous for the patient. Therefore, it is essential that individuals performing arterial puncture be familiar with the proper techniques, with the complications of the procedure, and with necessary precautions. Arterial blood is one of the specimens most sensitive to pre analytic effects. Improper patient assessment, test requisition, collection or transport of a specimen of arterial blood intended for pH, and blood gas analysis can alter the gas tensions, or pH, or both. In addition to pH/gases analysis, instruments are now available for the specific measurement of pH/gases and other critical care analysis on the same arterial whole-blood specimens. Therefore, scrupulous attention to the principles outlined in this standard is mandatory to eliminate a major potential source of erroneous laboratory results. This has traditionally been the role of the doctor, however by using an education and training package along with a competency-based assessment, nurses can now perform this extended role. Analysis of arterial blood can assist in the assessment of the patient's respiratory and metabolic systems. However, it should not be relied on in isolation when making clinical decisions: a thorough systematic clinical assessment of the patient with regular re-evaluation can be far more beneficial than the information obtained from a single arterial blood gas result [5].

Accurate results for an ABG depend on the proper manner of collecting, handling, and analyzing the specimen. Clinically important errors may occur at any of the above steps, but ABG measurements are particularly vulnerable to preanalytic errors. The most common problems that are encountered include nonarterial samples, air bubbles in the sample, inadequate or excessive anticoagulant in the sample, and delayed analysis of a noncooled sample[6].

Arterial blood gas (ABG) tests will help any healthcare professional to interpret certain conditions that influence your respiratory system, circulatory system, or metabolic processes in critical situations. The test requires a blood sample from your artery to measure the oxygen and carbon dioxide ranges in the blood. Again, it checks the balance of acids and bases, known as the pH of your blood. Our body normally very judiciously regulates the ranges of oxygen and carbon dioxide in the blood. Low blood oxygen levels or hypoxemia can give rise to many criticalities and damage your vital internal organs[7].

Except for intravenous therapy, arterial access is the most common invasive procedure performed on critically ill patients[8]. Arterial puncture is a source of pain and discomfort in critical care. Although pain cannot be completely eliminated during invasive procedures such as obtaining blood from an artery, pain should be minimized. In a study of 100 intensive care patients, punctures to obtain samples for ABG analysis were the No. 1 factor "that moderately or severely worried patients," and 48% of these patients' unpleasant experiences were associated with arterial blood sampling.

1.2. Problem statement

A study to assess the effectiveness of Self-instructional Module on knowledge regarding ABG among student Nurses in selected college of city.

1.3. Objectives

- To assess existing level of knowledge regarding ABG analysis among the students nurses in selected college.
- Assess the posttest knowledge regarding the ABG analysis among the student nurses in selected college.
- To assess the effectiveness of SIM on ABG analysis among the students nurses in Selected College.
- To find out the association between post-test levels of knowledge with selected Demographic level.

1.4. Operational definition

- **Assess**

According to oxford dictionary Assess means to evaluate the estimate the nature, value or quality. In this study assess refers to evaluate the knowledge to student regarding Arterial Blood Gas (ABG)

- **Knowledge**

According to oxford dictionary "knowledge means a person's range of information. In this study knowledge refers to information regarding Arterial Blood Gas (ABG)

- **Arterial blood gas**

Arterial blood gas analysis is a test in which measures the concentration of oxygen and carbon dioxide and bicarbonate in the blood as well as the acidity [PH] of the blood.

- **Sim**

In this study self-instructional module means the booklet containing information of Arterial Blood Gas (ABG).

1.5. Scope of the study

- A study will bring out information regarding knowledge on ABG analysis
- A study will help students to apply theoretical knowledge in practical way.
- The finding or study will help other researcher to do study in depth.

1.6. Assumptions

- It is assumed that students may have some knowledge about ABG analysis.
- SIM may enhance the knowledge of students regarding ABG analysis.

1.7. Research approach

Research approach indicates basic procedures for conducting study ". A research approach was selected by keeping in mind the objectives of a study. A research approach used was a quantitative approach. In this study descriptive research approach was used.

Hence ,the evaluative research approach was considered most appropriate for the present study because the primary objective of the study were to assess the knowledge of the undergraduate students about the ABG in theoretical and practical way.

1.8. Research design

Non experimental descriptive study design.

1.9. Setting of the study

Denise F. Polite and Cheryl Tantano Beck, " Setting is defined as specific places wg=here information is gathered." Setting may be natural setting or laboratory setting depending upon study topic and researcher's choice." A proposed study was undertaken in nursing college and Nursing colleges of Nagpur was selected for a study. The study was conducted in maharshi karve stree sikshan samstha Sitabai Nargundkar College Of Nursing for Women Nagpur. Reasons for the selected setting were:

- Economy in terms of time and transport
- Familiar place
- Administrative approval
- Co-Operation and availability of subjects

1.10. Population

Population for this study is undergraduate nursing students of 3rd year and 4th year

1.11. Target population

In this study the target population consisted of undergraduate nursing student at private nursing college, Nagpur.

1.12. Accessible population

In this study the accessible population was the 3rd year undergraduate nursing student of private nursing college, Nagpur.

1.13. Inclusion criteria

- Undergraduate students from selected nursing college of Nagpur city.
- Nursing students who are willing to participate in the study.
- Nursing students from Basic BSc Nursing 3rd year

1.14. Exclusion criteria

- Undergraduate students whose parents are related with health care profession.
- Fresh Third year and fourth year students.

1.15. Sample size

In this study the sample size consist of 60 samples undergraduate nursing student

1.16. Sampling techniques

Polite Denise F. Hungler Bernadette " sampling refers to the process of selecting portion of population to represent the entire population. Sampling plans with non

-probability sampling and probability sampling."

In this study non-probability convenient sampling technique was used to select the sample.

1.17. Tools for data collection

The tool comprises of two sections:

- Section 1-Demographic variable
- Section 2-Questionnaire based on ABG with the help of self instructional module

1. **Section A:** Distribution of nursing students with regards to demographic variables.
2. **Section B:** Assessment of level of pretest and posttest knowledge regarding ABG .among nursing students.
3. **Section C:** Assessment of effectiveness of Self Instructional Module on knowledge regarding ABG among nursing students.
4. **Section D:** Association of posttest knowledge score regarding ABG among nursing students with their selected demographic variables.

1.18. Data collection procedure

The data for the study was collected and the investigator prior to commencing the task of data collection, a letter seeking permission to conduct study was forward by principal of private nursing college, Nagpur. As a result, investigator obtained administrative permission for director of private nursing college, Nagpur.

Data collection for demographic variable was done by self-structured questionnaire schedule. Sample was selected convenient sampling, those who meet the inclusion criteria for sample selection. Total sample was 60. The tool should

be given. The investigator introduced herself to the subject and established good rapport with them and explains about the purpose of the study. All respondent co-operated well with investigator during data collection. The data collection process was terminated and thanks to the respondent for their cooperation and prompt response. The collected data was compiled for data collection.

2. Results and discussion

A structured questionnaire to collect the knowledge score was use for data collection and the analysis was done with the help of inferential and descriptive statistics. The data collection was done from 60 samples from basic BSc nursing 3rd year students. Analysis and interpretation was done on the basis of objectives of the study.

2.1. SECTION A

Table 1 Percentage wise distribution of Nursing Students according to their demographic characteristics (n=60)

Demographic Variables	No. of nursing students	Percentage (%)
Age(yrs.)		
19-20 yrs.	19	31.7
20-21 yrs.	36	60.0
21-22 yrs.	5	8.3
22-23 yrs.	0	0
Education		
B.BSc Third Year	60	100
B.BSc Fourth Year	0	0
Institution		
Government	0	0
Private	60	100
Observe ABG analysis procedure		
Yes	35	58.3
No	25	41.7
Learn about ABG		
Yes	60	100
No	0	0
Number of procedure witness		
0	25	41.7
1	18	30.0
2	14	23.3
3	3	5.0
Residential Area		
Urban	60	100
Urban Slum	0	0
Rural	0	0
Maximum clinical exposure in area		

Ward	36	60.0
Casualty	14	23.3
ICU	10	16.7

2.2. SECTION B

2.2.1. Assessment of level of knowledge regarding abg among nursing students from selected nursing colleges of Nagpur city.

This section deals with the assessment of level of knowledge regarding ABG among nursing students from selected nursing colleges of Nagpur city. The level of knowledge score is divided under following heading of poor, average, good and excellent.

Table 2 Assessment with level of pretest knowledge n=60

Level of pre-test knowledge	**Score Range**	**Level of Pre-test Knowledge Score**	
		No of nursing students	**Percentage**
Poor	0-25%	16	26.67
Average	26-50%	35	58.33
Good	51-75%	9	15
Excellent	76-100%	0	0
Minimum score		2	
Maximum score		15	
Mean knowledge score		7.80 ± 3.35	
Mean % Knowledge Score		35.45 ± 15.26	

The above table shows that 26.67% of the nursing students had poor level of knowledge score, 58.33% had average and 15% of nursing students had good level of knowledge score.

Minimum knowledge score in pretest was 2 and maximum knowledge score in pretest was 15.

Mean knowledge score in pretest was 7.80±3.35 and mean percentage of knowledge score in pretest was 35.45±15.26.

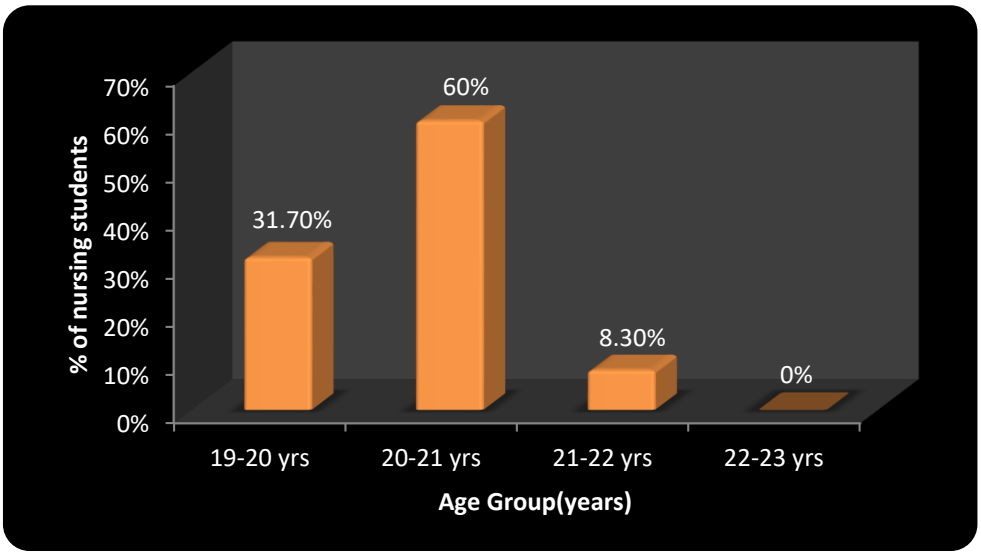

Figure 1. Assessment with pre-test knowledge score

Table 3 Assessment with level of posttest knowledge n=60

Level of post-test knowledge	Score Range	Level of Post-test Knowledge Score	
		No of nursing students	Percentage
Poor	0-25%	0	0
Average	26-50%	3	5
Good	51-75%	21	35
Excellent	76-100%	36	60
Minimum score		11	
Maximum score		21	
Mean knowledge score		16.80 ± 2.37	
Mean % Knowledge Score		76.36 ± 10.80	

The above table shows that 5% of the nursing students had average level of knowledge score, 35% had good and 60% of nursing students had excellent level of knowledge score.

Minimum knowledge score in posttest was 11 and maximum knowledge score in posttest was 21.

Mean knowledge score in posttest was 16.80±2.37 and mean percentage of knowledge score in posttest was 76.36±10.80.

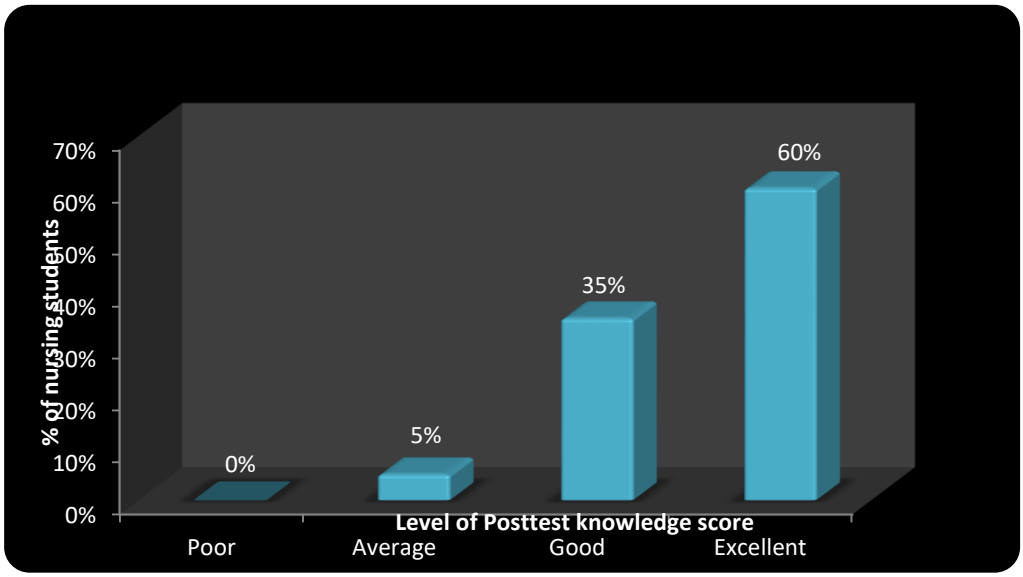

Figure 2 Assessment with post-test knowledge score

2.3. SECTION C

2.3.1. Evaluation of effectiveness of self-instructional module on knowledge regarding abg among nursing students in selected nursing college of Nagpur city

This section deals with the effectiveness of Self Instructional Module on knowledge regarding ABG among nursing students from selected nursing college of Nagpur City. The hypothesis is tested statistically with distribution of pretest

and posttest mean and standard deviation and mean percentage knowledge score. The levels of knowledge during the posttest and posttest are compared to prove the effectiveness of Self Instructional Module. Significance of difference at 5% level of significance is tested with student's paired 't' test and tabulated 't' value is compared with calculated 't' value. Also the calculated 'p' values are compared with acceptable 'p' value i.e. 0.05.

Table 4 Significance of difference between knowledge score in pre and posttest of Nursing students n=60

Overall	Mean	SD	Mean Difference	t-value	p-value
Pre Test	7.80	3.35	9±4.62	15.07	0.0001 S,p<0.05
Post Test	16.80	2.37			

This table shows the comparison of pretest and posttest knowledge scores of nursing student regarding ABG. Mean standard deviation and mean difference values are compared and student's paired 't' test is applied at 5% level of significance. The tabulated value for n=60-1 i.e. 59 degrees of freedom was 2.00. The calculated 't' value i.e. 15.07 are much higher than the tabulated value at 5% level of significance for overall knowledge score of nursing students which is statistically acceptable level of significance. Hence it is statistically interpreted that the Self Instructional Module on knowledge regarding ABG among nursing students was effective. Thus the H_1 is accepted.

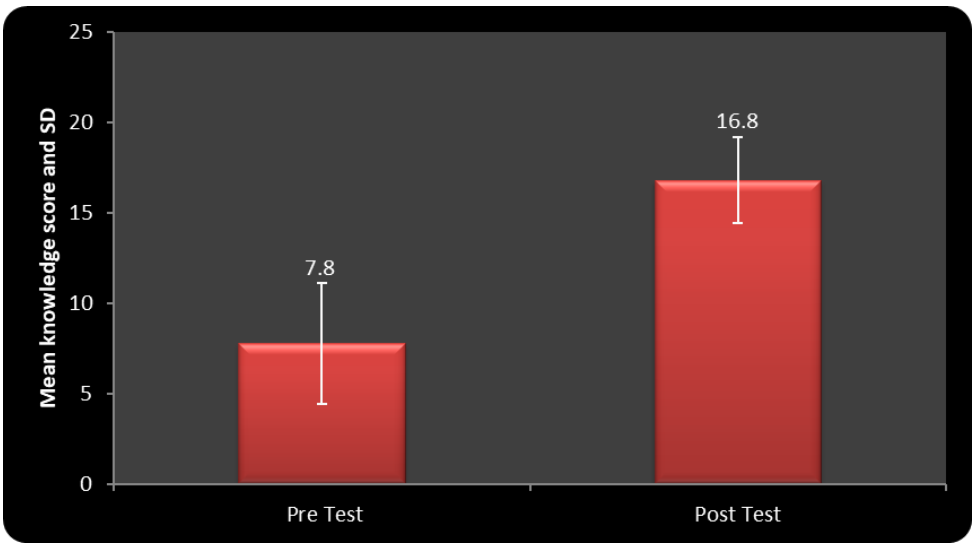

Figure 3 Significance of difference between knowledge score in pre and post-test of Nursing Students

2.4. SECTION D

2.4.1. Association of level of posttest knowledge score regarding abg among nursing students from selected nursing colleges of Nagpur city in relation to demographic variables

Table 5 Association of posttest knowledge score regarding ABG among nursing students in relation to age in years n=60

Age (yrs.)	No. of nursing students	Mean post-test knowledge score	F-value	p-value
19-20 yrs.	19	16.26±2.40	1.07	0.37 NS,p>0.05
20-21 yrs.	36	17.16±2.23		
21-22 yrs.	5	16.20±3.27		
22-23 yrs.	0	0±0		

This table shows the association of knowledge score with age in years of nursing students from selected nursing colleges of Nagpur city. The tabulated 'F' values was 3.15(df=2, 57) which is much higher than the calculated 'F' i.e. 1.07 at 5%

level of significance. Also the calculated 'p'=0.37 which was much higher than the acceptable level of significance i.e. 'p'=0.05. Hence it is interpreted that age in years of nursing students is statistically not associated with their posttest knowledge score.

Table 6 Association of posttest knowledge score regarding ABG among nursing students in relation to observe ABG analysis procedure n=60

Observe analysis procedure	No. of nursing students	Mean post-test knowledge score	F-value	p-value
Yes	35	16.88±2.36	0.32	0.74 NS,p>0.05
No	25	16.68±2.44		

This table shows the association of knowledge score with observes analysis procedure of nursing students from selected nursing colleges of Nagpur city. The tabulated 't' values was 2.00(DF=58) which is much higher than the calculated 't' i.e. 0.32 at 5% level of significance. Also the calculated 'p'=0.74 which was much higher than the acceptable level of significance i.e. 'p'=0.05. Hence it is interpreted that observe analysis procedure of nursing students is statistically not associated with their posttest knowledge score.

The data collection was done from 60 samples from basic BSc nursing 3rd year students of age group 31.70% of 19-20 years, 60% of 20-21 year and 8.30% of 21-22 years studying in private nursing college of Nagpur city

The pretest shows 26.67% of the nursing student had poor level of knowledge score 58.33% had average and 15% had good level of knowledge score

The posttest shows 5% nursing student had average level of knowledge score 35% had good and 60% of nursing student have excellent level of knowledge score

This present study statistically interpreted that the self-instructional module on knowledge regarding ABG analysis among nursing students was effective.

3. Discussion

In Sarah Morton-March 2022 study was conducted on the pre hospital guidelines states that monitoring should match in hospital standards but consensus on the use of arterial blood gas (ABG) and arterial line remains unclear. The aim was to perform a systematic literature review and survey of UK helicopter emergency medical services (HEMS) use and perceptions of ABGs and arterial lines. The methods in a systematic literature review were conducted for arterial lines and ABGs and prehospital care additionally to questionnaires were distributed to all UK HEMS (questionnaire 1: current clinical practice and questionnaire 2: clinical opinions). Results was from 1,028 results, 13studies (10 ABGs and 3 arterial lines) were included, demonstrating it is feasible to obtain ABGs and place arterial lines in the pre hospital setting. There were concerns about practical difficulties for ABGs and the time taken for arterial lines. Survey responses were obtained from all UK HEMS (N=22). Six services carry equipment for performing ABGs and nine services for arterial lines. Clinicians expressed concerns relating to the time taken to perform both procedure but most believed it would allow better monitoring and more targeted treatment.

Supporting above study, our study pretest knowledge score was 26.67% poor, 58.33% average and 15% had good level of knowledge score. The finding shows that nursing student had some knowledge regarding ABG prior providing them the self-instructional module. The total mean percentage of knowledge score of pretest was 35.45± 15.26. In posttest most of the student nurses scored good marks due to effective self-instructional module on ABG. The posttest knowledge score was 5% average level, 35% good and 60% excellent level of knowledge score. The post test score was significantly higher than the pretest score and the mean percentage knowledge score was76.36±10.80. The t-value is 15.07 are much higher than the tabulated value at 5% level of significance for overall knowledge score of nursing students which is statistically acceptable level of significance. Hence it is statistically interpreted that the self-instructional module on knowledge regarding ABG among nursing student was effective. Thus the H1 is accepted.

Recommendation

On the basis of finding of study the following recommendation have been made for the study-

- A Descriptive study can be conducted.
- A similar study can be replicated with a controlled group.
- Other strategies can be used for a similar study.

Compliance with ethical standards

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Disclosure of Conflict of interest

Authors have declared no conflict of interest exists.

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