Original Article

Comparative study to assess the Effect of Standing Position & Sitting Position on Blood Pressure Reading among Normotensive Subject

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Abstract

Introduction: Blood pressure measurement is a basic clinical procedure and perhaps the most frequently performed clinical procedure in any health care setting, it strongly depends both on the number of measurements and the body position during the procedure. Many important therapeutic decisions rely on the accuracy of assessment, unfortunately, blood pressure measurement is one of the most inaccurately performed procedure done by healthcare provider. Inspire of studies having shown that many errors are made while recording BP, crucial decisions about treatment are made based on these inaccurate measurements.

OBJECTIVES1.To assess the effects of standing position on blood pressure reading among Normotensive Subject. 2.To assess the effects of sitting position on blood pressure reading among Normotensive Subject. 3.To determine comparison between the effects of Standing position & Sitting position on blood pressure reading among normotensive Subject. 4.To examine the association between Standing position & Sitting position with selected demographic variable among normotensive subjects. AIM: The aim of the study to identify differences in blood pressure changes according to body position.

Materials And Methods: The sample consisted 80 Normotensive Subjects From selected hospitals in Nadiad City. The Demographic data were collected using a Self Structured Questionnaire. The Self Structured Blood Pressure record sheet was used .

Results: In our study, With regard to level of blood pressure among normotensive subjects in sitting position, 53 (66.25%) are normal, 23 (28.75%) are pre-hypertensive, 3 (3.75%) are at stage-1, 1 (1.25%) are having hypotension, 0(0) are not having any hypertensive disorders out of 80 normotensive subjects.With regard to level of blood pressure among normotensive subjects in standing position, 44 (55%) are normal, 29 (36.25) are pre-hypertensive, 6 (7.50%) are at stage-1, 1 (1.25%) are having hypotension, 0(0) are not having any hypertensive disorders out of 80 normotensive subjects.

Conclusion: this study reports the Effect of Standing Position & Sitting Position on Blood Pressure Reading among Normotensive Subject . Majority of the subjects had higher blood pressure in standing position. The study found that the blood presssure is higher in the standing position than in the sitting position.

Keywords: Assess, Comparative, Effects, Standing Position, Sitting Position, Normotensive, Blood Pressure.

INTRODUCTION

Blood Pressure Monitoring is one of the most commonly used technique in the diagnosis and treatment of various health care problems.1Hypertension affects hundreds of millions of subject worldwide and currently represents a major public health issue in the agenda of all developed countries. Both for the identification and clinical management of hypertensive subjects, the measurement of blood presssure is a crucial practice.5,7unfortunately, the blood pressure measurement is one of the most inaccurately performed procedure done by healthcare provider. Crucial decisions about treatment are based on these inaccurate measurements4. An individual`s Blood Pressure measurement is influence by many factors including age, weight, physical condition, past illness, time of the day, alltitudee, activity and climate in daily clinical practice, body position is neglected while taking blood pressure reading and considering that as baseline drug dosage are adjusted. One of the ignore factors while recording blood pressure is crossing of legs which causes pooling of blood in legs due to compression of the veins, thus affecting the correct BP reading.6Blood Pressure is the Force that`s exerted by your blood on the wall of your arteries. It`s known

changing position can impact your blood pressure reading. However, there`s some disagreement about whether readings are higher or lower when you`re Sitting. Currently, the American Heart Association recommends that blood pressure reading be taken when you`re sitting down. 2when individual stand up from lying down or sitting, a small momentary dip in blood pressure occurs in the first few seconds. This occurs because gravity causes about 0.5 to 1.0 liters of blood to pool in lower body.3those individual with larger differences in blood pressure as measured in supine or sitting position may be at risk of substancial changes in their therapeutic history according to the position of the measurement. 8The purpose of the study to identify differences in blood pressure changes according to body position by age group , In the present study we have investigated the influence of several body position including sitting position and standing position on the indirect blood pressure measurements in normotensive subjects. To obtain objective readings the blood pressure was measured semi automatically with an oscillometric sphygmomanometer device proven to register the blood pressure accurately.

Objective of the study were

- To assess the effects of standing position on bloodpressure reading among Normotensive Subject.
- To assess the effects of sitting position on blood pressure reading among Normotensive Subject.
- To determine compression between the effects of Standing position & Sitting position on blood pressure reading among normotensive Subject.
- To examine the association between Standing position & Sitting position with selected demographic variable among normotensive subjects.

Methods:

A descriptive comparative study was conducted in 2022 by distributing a self structured questionnaire among normotensive subjects. A brief description of study objectives was explained and by convenience, those who agrred to respond to the questionnaire confirmed their agreement through signing the consent form. Participants who were not willing to participate, People Who Are Not Available At the Time of Data Collection, Individuals Who Are Having Breathing Difficulty and Giddiness at the Time of Data Collection Procedure and Individuals in Acute Pain or any Serious Health Problem Arises At the time of Data Collectionwere excluded.This study was approved by the institutional research committee of the Dinsha Patel College of Nursing, Gujarat. Participation was voluntary with assurance about the confidentiality of their information, as no identifiers or personal information were collected.

The data collection tool comprised of 2 sections, namely the participant`s demographic details, the blood pressure recording sheet. participant`s detail include age (years), gender, height, weight, education, occupation, family history of hypertension, food habit, bad habit and exercise. The concurrent validity and reliability were obtained by (karl pearson) data were analyzed using inferential and regressive analysis.

Result:

Among 80 normotensive subjects, the majority 45(56.25%) of them belongs to female, 35(43.75%) are males and 0 (0%) are transgender. With regard to age in years among normotensive subjects, the majority 46(57.50%) of them belongs to 21-30 years, 23 (28.75%) are 31-40 years and 11 (13.75%) are 41-50 years.With regard to height among normotensive subjects, the majority 55(68.75%) of them belongs to 141-60 cm, 22 (27.50%) are 161-180 cm and 3 (3.75%) are ≤140 cm .With regard to weight among normotensive subjects, the majority 36(41.25%) of them belongs to 31-50 kg 33 (41.25%) are 51-70kg, 11 (13.75%) are 71-90 kg and 0 (0%) are ≤30 kg and >90kg. With regard to education among normotensive subjects, the majority 30(37.50%) of them are graduated, 22 (27.50%) are secondary education, 13 (16.25%) are higher secondary, 7 (8.75%) are primary educated, 6 (7.50%) are post-graduated and 2 (2.5%) are illiterate. With regard to occupation among normotensive subjects, the majority 31(38.75%) of them are unemployment, 30 (37.50%) are government employee, 15 (18.75%) are self-employee, 3

(3.75%) retired and 1 (1.25%) are business. With regard to food habits among normotensive subjects, the majority 47(58.75%) of them are vegetarian, 33 (41.25%) are mixed vegetarian and 0 (0%) are non-vegetarian. With regard to habits among normotensive subjects, the majority 61 (75.25%) of them are not having any habits, 13 (16.25%) are having habit of tobacco chewing, 6 (7.25%) are having other habits and 0 (0%) having habits of smoking and alcohol With regard to family history among normotensive subjects, the majority 59 (73.75%) of them are not having any family history of blood pressure, 21 (26.25%) are having family history of blood pressureWith regard to exercise among normotensive subjects, the majority 53 (66.25%) of them are not doing exercise and 27 (33.75%) are doing exercise.

With regard to level of blood pressure among normotensive subjects in sitting position, the range of systolic blood pressure is from 139-80, the mean of systolic blood pressure is 110.9, standard deviation of systolic blood pressure is 11.39 and the standard error of systolic blood pressure is 1.27 With regard to level of blood pressure among normotensive subjects in sitting position, the range of diastolic blood pressure is from 103-60, the mean of systolic blood pressure is 78.67, standard deviation of systolic blood pressure is 8.57 and the standard error of systolic blood pressure is 0.95.

With regard to level of blood pressure among normotensive subjects in standing position, the range of systolic blood pressure is from 140-82, the mean of systolic blood pressure is 112.1, standard deviation of systolic blood pressure is 11.4 and the standard error of systolic blood pressure is 1.27 With regard to level of blood pressure among normotensive subjects in standing position, the range of diastolic blood pressure is from 107-61, the mean of systolic blood pressure is 81.57, standard deviation of systolic blood pressure is 7.46 and the standard error of systolic blood pressure is 0.83With regard to level of blood pressure among normotensive subjects in sitting position, 53 (66.25%) are normal, 23 (28.75%) are pre-hypertensive, 3 (3.75%) are at stage-1, 1 (1.25%) are having hypotension, 0(0) are not having any hypertensive disorders out of 80 normotensive subjectsWith regard to level of blood pressure among normotensive subjects in standing position, 44 (55%) are normal, 29 (36.25) are pre-hypertensive, 6 (7.50%) are at stage-1, 1 (1.25%) are having hypotension, 0(0) are not having any hypertensive disorders out of 80 normotensive subjects.

Table 1. Demographic Details (N=80)

Demographic variables	Frequency	Percentage
1.Gender:		
A. Male	35	43.75
B. Female	45	56.25
C. Transgender	0	0
2. Age (in years):		
A. 21-30	46	57.50
B. 31-40	23	28.75
C. 41-50	11	13.75
3. Height :		
A. ≤140 cm	3	3.75
B. 141-160 cm	55	68.75
C. 161-180 cm	22	27.50
D. >180 cm	0	0
4. Weight:		
A. ≤30 kg	0	0
B. 31-50 kg	36	45
C. 51-70 kg	33	41.25
D. 71-90 kg	11	13.75
E. >90 kg	0	0
5.Education:		
A. Illiterate	2	2.5
B. Primary	7	8.75
C. Secondary	22	27.50
D. Higher	13	16.25
secondary	30	37.50
E. Graduation	6	7.50
F. Post-graduation		
6. Occupation :		
A. Unemployment	31	38.75

B. Self-employee	15	18.75
C. Government	30	37.50
employee	1	1.25
D. Business	3	3.75
E. Retired		
7. Food habits:		
A. Vegetarian	47	58.75
B. Non vegetarian	0	0
C. Mixed	33	41.25
8. Habits:		
A. Tobacco	13	16.25
chewing	0	0
B. Smoking	0	0
C. Alcohol	6	7.25
D. Others	61	75.25
E. None		
9. Family history :		
A. Yes	21	26.25
B. No	59	73.75
10. Exercise :		
A. Yes	27	33.75
B. No	53	66.25

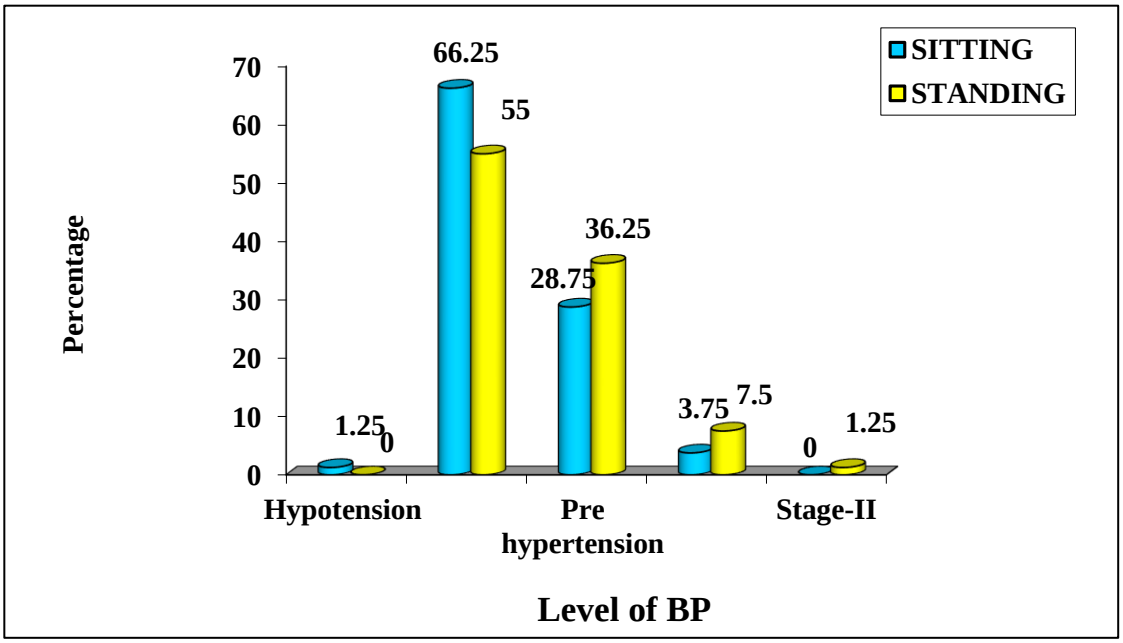

Figure 1: Frequency and percentage wise the effect of standing and sitting position on blood pressure reading among normotensive subjects

With regard to level of blood pressure among normotensive subjects in sitting position, 53 (66.25%) are normal, 23 (28.75%) are pre-hypertensive, 3 (3.75%) are at stage-1, 1 (1.25%) are having hypotension, 0(0) are not having any hypertensive disorders With regard to level of blood pressure among normotensive subjects in standing position, 44 (55%) are normal, 29 (36.25) are pre-hypertensive, 6 (7.50%) are at stage-1, 1 (1.25%) are having hypotension, 0(0) are not having any hypertensive disorders.

Table 2: Frequency and percentage wise the effect of standing and sitting position on blood pressure reading among normotensive subjects

Level of BP	SITTING		STANDING	
	F	%	f	%
Hypotension	**1**	**1.25**	**0**	**0**
Normal	**53**	**66.25**	**44**	**55**
Pre hypertension	**23**	**28.75**	**29**	**36.25**
Stage -I	**3**	**3.75**	**6**	**7.50**
Stage-II	**0**	**0**	**1**	**1.25**
Overall	**80**	**100**	**80**	**100**

Table 3 Association for level of blood pressure in sitting position and selected demographic data

Demographic variables	Hypotension		Normal		Pre hypertension		Stage -I		χ2value	p-value
	f	%	f	%	f	%	f	%		
1.Gender:										
Male	0	0	20	25	12	15	3	3.75	6.07	0.108
Female	1	1.25	33	41.25	11	13.75	0	0	(df=2)	NS
Transgender	0	0	0	0	0	0	0	0		
2.Age (in years):										
21-30	1	1.25	33	41.25	11	13.75	1	1.25	3.69	0.718
31-40	0	0	13	16.25	9	11.25	1	1.25	(df=1)	NS
41-50	0	0	7	8.75	3	3.75	1	1.25		
3.Height :										
≤140 cm	0	0	3	3.75	0	0	0	0	4.81	0.563
141-160 cm	1	1.25	35	43.75	18	22.5	1	1.25	(df=6)	NS
161-180 cm	0	0	15	18.75	5	6.25	2	2.50		
>180 cm	0	0	0	0	0	0	0	0		
4.Weight:										
≤30 kg	0	0	0	0	0	0	0	0	14.46	0.025*
31-50 kg	1	1.25	28	35	6	7.50	1	1.25	(df=6)	S
51-70 kg	0	0	21	26.25	12	15	0	0		
71-90 kg	0	0	4	5	5	6.25	2	2.5		
5.Eduction:										
Illiterate	0	0	1	1.25	1	1.25	0	0	22.69	0.091
Primary	0	0	2	2.50	5	6.25	0	0	(df=15)	NS
Secondary	0	0	14	17.5	5	6.25	3	3.75		
Higher secondary	1	1.25	9	11.25	3	3.75	0	0		
Graduation	0	0	24	30	6	7.50	0	0		
Post-graduation	0	0	3	3.75	3	3.75	0	0		
6.Occupation :										
Unemployment	1	1.25	22	27.50	7	8.75	1	1.25	11.71	0.469
Self-employee	0	0	7	8.75	8	10	0	0	(df=12)	NS
Government employee	0	0	21	26.25	7	8.75	2	2.50		
Business	0	0	0	0	1	1.25	0	0		
Retired	0	0	3	3.75	0	0	0	0		
7.Food habits:										
Vegetarian	0	0	29	36.25	17	21.25	1	1.25	4.76	0.190

Non vegetarian	0	0	0	0	0	0	0	0	(df=3)	NS
Mixed	1	1.25	24	30	6	7.50	2	2.50		
8.Habits:										
Tobacco chewing	0	0	5	6.25	5	6.25	3	3.75	20.54	0.002**
Smoking	0	0	0	0	0	0	0	0	(df=3)	HS
Alcohol	0	0	0	0	0	0	0	0		
Others	0	0	6	7.50	0	0	0	0		
None	1	1.25	42	52.50	18	22.50	0	0		
9. Family history										
Yes	0	0	14	17.50	7	8.75	0	0	1.63	0.652
No	1	1.25	39	48.75	16	20	3	3.75	(df=1)	NS
10. Exercise:										
Yes	0	0	17	21.25	9	11.25	1	1.25	0.87	0.832
No	1	1.25	36	45	14	17.50	2	2.50	(df=2)	NS

Table 4 Association for level of blood pressure in standing position and selected demographic data

Demographic variables	**Normal**		**Pre hypertension**		**Stage -I**		**Stage -II**		**χ2value**	**p-value**
	F	**%**	**f**	**%**	**f**	**%**	**f**	**%**		
1.Gender:										
Male	14	17.50	15	18.75	5	6.25	1	1.25	8.41	0.038*
Female	30	37.50	14	17.50	1	1.25	0	0	(df=3)	S
Transgender	0	0	0	0	0	0	0	0		
2.Age(in years):										
21-30										
31-40	29	36.25	15	18.75	2	2.50	0	0	5.82	0.443
41-50	10	12.50	9	11.25	3	3.75	1	1.25	(df=6)	NS
	5	6.25	5	6.25	1	1.25	0	0		
4.Weight:										
≤30 kg	27	33.75	8	10	1	1.25	0	0	17.80	0.007**
31-50 kg	14	17.50	16	20	3	3.75	0	0	(df=6)	HS
51-70 kg	0	0	0	0	0	0	0	0		
71-90 kg	3	3.7	5	6.2	2	2.5	1	1.25		
5.Eduction:										
Illiterate	1	1.25	1	1.25	0	0	0	0	9.95	0.823
Primary	2	2.50	4	5	1	1.25	0	0	(df=15)	NS
Secondary	10	12.50	8	10	3	3.75	1	1.25		
Higher	9	11.25	4	5	0	0	0	0		
Secondary	19	23.75	10	12.5	1	1.25	0	0		
Graduation	3	3.75	2	2.5	1	1.25	0	0		
Post-graduation										
6.Occupation										
Unemployment	18	22.50	12 4	15	1	1.25	0	0	6.09	0.911
Self-employee	9	11.25	11	5	2	2.50	0	0	(df=12)	NS
Government	15	18.75	1	13.75	3	3.7	1	1.25		
employee	0	0	1	1.25	0	0	0	0		
Business	2	2.50		1.25	0	0	0	0		
Retired										
7.Food habits:										
Vegetarian	23	28.75	19 0	23.7	5	6.25 0	0	0	4.23	0.238
Non vegetarian	0	0	10	0	0	1.25	0	0	(df=3)	NS
Mixed	21	26.25		12.50	1		1	1.25		

8.Habits:										
Tobacco chewing	5	6.25	3	3.75	4	5	1	1.25	18.09	0.006**
Smoking	0	0	0	0	0	0	0	0	(df=6)	HS
Alcohol	0	0	0	0	0	0	0	0		
Others	4	5	2	2.50	0	0	0	0		
None	35	43.75	24	30	2	2.5	0	0		
9.Family history :										
Yes	9	11.25	10	12.50	2	2.50	0	0	2.29	0.514
No	35	43.75	19	23.750	4	5	1	1.25	(df=3)	NS
10.Exercise :										
Yes	14	17.50	10	12.50	3	3.75	0	0	1.29	0.730
No	30	37.50	19	23.75	3	3.75	1	1.25	(df=3)	NS

Association of the level of blood pressure in sitting and standing position with demographical data among normotensive subjects. Thestudy represents that there was statistical significance between the blood pressure in sittingand standing position with Gender,Weight and Habits. There was no statistical significance between the level of blood pressure in sitting position with other sociodemographic variables like age, education, occupation, food habits, exercise and family history of hypertensions etc.

Table 5 Summary of t values for blood pressure in Sitting and standing position

Level of BP	**SITTING**			**STANDING**			**Difference in Mean**	**'t' test**	**p-value**
	Mean	**SD**	**Mean%**	**Mean**	**SD**	**Mean%**			
SYSTOLIC BP	**110.9**	**11.39**	**1.27**	**112.1**	**11.4**	**1.27**	**1.16**	**1.68**	**0.096(NS)**
DIASTOLIC BP	**78.67**	**8.57**	**0.95**	**81.57**	**7.46**	**0.83**	**2.9**	**4.83**	**P<0.001***(HS)**

The t-test shows that the systolic blood pressure is 1.68 where the chi-square is 0.06 which is not significant. The t-test shows that the diastolic blood pressure is 4.83 where the chi-square is P<0.001*** (HS) which is highly significant.

DISCUSSION:

The finding of the study was discussed with the objectives and hypothesis stated. The present study was undertaken to assess the effectiveness of Standing & Sitting position on Blood Pressure reading among normotensive subjects between the age of 20 to 50. The mean difference between sitting and standing position in systolic blood pressure is 1.16. The mean difference between sitting and standing position in diastolic blood pressure is 2.9.

CONCLUSION:

This study reports the Effect of Standing Position & Sitting Position on Blood Pressure Reading among Normotensive Subject. Majority of the subjects had higher blood pressure in standing position. The study found that the blood presssure is higher in the standing position than in the sitting position.

Ethics Declaration and Consent

Dinsha patel college of nursing, institute ethics committee reviewed this study and granted ethical approval. Consent has been obtained from all participants.

REFERENCES

1. Foster-Fitzpatrick L, Anna Ortiz BS, Sibilano H.The Effects of Crossed Leg on. Nursing Research. 1992;48:105-8 https://www.researchgate.net/publication/313446822_Effect_of_Standing_Position_and_Sitting_Crossed_Leg_Position_on_Blood_Pressure-Literature_Review
2. https://www.healthline.com/health/blood-pressure-lying-down
3. Christy Callahan. [Internet]. [updated Jun 11, 2016]. Available from: http://www.livestrong.com/article/299614-blood-pressure-supine-vs-standing
4. https://www.jpns.in/html-article/14285
5. World Health Organization. Global Strategy on Diet, Physical Activity and Health. Accessed 2 February 2011.http://www.who.int/dietphysicalactivity/strategy/eb11344/strategy_english_web.pdf
6. N Kallioinen A Hill M S Horswill H E Ward M O Watson Sources of inaccuracy in the measurement of adult patients' resting blood pressure in clinical settingsJ Hypertens20173534214110.1097/hjh.0000000000001197 https://www.jpns.in/html-article/14285
7. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JLJr, Jones DW, Materson BJ, Oparil S, Wright JTJr, Roccella EJJoint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. National Heart, Lung, and Blood Institute; National High Blood Pressure Education Program Coordinating Committee. Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Hypertension 2003;42:1206–1252. https://academic.oup.com/ajh/article/24/10/1073/2281918
8. Pickering TG, Hall JE, Appel LJ, Falkner BE, Graves J, Hill MN, Jones DW, Kurtz T, Sheps SG, Roccella EJ. Recommendations for blood pressure measurement in humans and experimental animals: part 1: blood pressure measurement in humans: a statement for professionals from the Subcommittee of Professional and Public Education of the American Heart Association Council on High Blood Pressure Research. Circulation 2005;111:697–716. https://academic.oup.com/ajh/article/24/10/1073/2281918
9. Ansdell, G "Diagnostic and statistical manual of mental disorders, Fourth Edition" TextRevision, Washington, DC: American Psychiatric Association, 2011, pp310 - 320
10. Bhaskar Rao "Methods of bio statistics" (2nd edition), 2004, Hyderabad: Paras Publishing, p- 280.
11. Bowker J. "The Oxford Dictionary of World Religions", New York: Oxford UniversityPress; 1997. pp. 1058–9.
12. Dr.Young "Reduction of stress among nursing students", The University of Victoriacommunity newspaper, (2000) July 14, pp – 55-65.
13. Fiona Timmins, (2002) "Stress in 12 areas among nursing students". Journal of NursingManagement Volume 13 Issue 6, Pages 477 – 482
14. Brown RP, Gerbarg PL. 2005, Sudarshan Kriya Yogic Breathing in the Treatment ofStress, Anxiety, and Depression, Part I — Neurophysiologic Model. J AlternComplement Med,1:189–201. [PubMed]
15. Eun Y Lee, Rampes H, Tuffrey V, Richardson J, Pilkington K, Ramaratnam S. Yoga foranxiety: A systematic review of the research evidence. Br J Sports Med. 2011;39:884–91. [PMC free article] [PubMed]
16. DuttaParul:"A BOOK OF PEDIATRIC NURSING"2nd edition Published by Jaypee, India.
17. Basavanthappa .B.T:"BOOK OF NURSING RESEARCH" 2nd edition, Jaypeebrothersmedical publisher, Pvt. Ltd, New Delhi.
18. Grove Burns:"A TEXTBOOK OF UNDERSTANDING NURSING RESEARCH BUILDING AND EVIDENCE BASED ON PRACTICE" 4thedition Published by Elsevier in India.
19. Suthar DB, Nagar K. A Study To Assess The Effectiveness Of Planned Teaching Programme On Prevention Of Selected Life Style Diseases In Terms Of Knowledge And Attitude Among Male Adults At Selected PHC Of Kheda District. Indian J Forensic Med Toxicol. 2021 May 17;15(3):15732. doi: 10.37506/ijfmt.v15i3.15732. PMID: 34434007.
20. Christian A, Nagar K. Understanding Patients Experiences Living with Diabetes Mellitus: A Qualitative Study, Gujarat, India. J Pharm Res Int. 2021;33(58A):464-471. doi: 10.9734/jpri/2021/v33i58A34139 . Epub 2021 Dec 15. PMID: 35024509 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7336663/
21. Selina, C., Anushka, P., Devanshi, P., Dhruti, B., Jinal, D., Manjari, B., Hiral, V., Janki, P. and Nagar, K. (2021) "Perception and Behavioural Outcome towards COVID-19 Vaccine among Students and Faculties of Nursing Colleges at Gujarat", Journal of Pharmaceutical Research International, 33(52B), pp. 120-128. doi: 10.9734/jpri/2021/v33i52B33607.
22. Ms. Shweta Prajapati and Mr. Kailash Nagar (2022) "Safety Education on Knowledge, Attitude and Practice Towards Road Traffic Signs and Regulations Among College Students At, Gujarat", Journal of Pharmaceutical Negative Results, pp. 948–958. doi: 10.47750/pnr.2022.13.S04.112.
23. Dr. Sharma Suresh K.: "A BOOK OF NURSING RESEARCH ANDSTATISTICS'Elsevier publication Pvt. Ltd. India.