

## ASSESSMENT OF KNOWLEDGE AND AWARENESS REGARDING METABOLIC SYNDROME AND ITS COMPONENTS AMONG UNDERGRADUATE PHYSIOTHERAPY STUDENTS

CHIGULAPALLI NEHA<sup>1</sup>, KRISHNA VENI DV<sup>2\*</sup>, SOUNDARYA VEMURI<sup>1</sup>, SRAVYA REDDY<sup>3</sup>

<sup>1</sup>Apollo Institute of Medical Sciences and Research, Hyderabad, Telangana, India. <sup>2</sup>Department of Biochemistry, Apollo Institute of Medical Sciences and Research, Hyderabad, Telangana, India. <sup>3</sup>Apollo Institute of Medical Sciences, Hyderabad, Telangana, India.  
Email: dr.dvkvenibio@gmail.com

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### ABSTRACT

**Objective:** The objective of the study was to assess the level of knowledge and awareness about metabolic syndrome (Met S) and its components among the 1<sup>st</sup> year physiotherapy students and also the difference in the level of knowledge and awareness among male and female students.

**Methods:** A self-administered structured questionnaire consisting of 90 questions about components of Met S was distributed among 38 students studying 1<sup>st</sup> year physiotherapy at Apollo College of Physiotherapy, Hyderabad, after obtaining a written consent from them. The data extracted were tabulated, statistically analyzed and results were obtained.

**Results:** Physiotherapy students have good knowledge about types and causes of diabetes and poor knowledge about symptoms, biochemical process, and complications of Met S. They expressed poor knowledge to understand the link between hypertension and pregnancy. They could understand the role of hereditary factors only in diabetes but not in other components.

**Conclusion:** Met S is a common disorder in the society; therefore, the awareness should be raised among the student population and as paramedics, it is their responsibility to communicate with the public about the risk factors and complications associated with it and counsel them to adopt a healthy lifestyle to protect themselves from the complications.

**Keywords:** Metabolic syndrome, Physiotherapy students, First year, Awareness, Knowledge.

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### INTRODUCTION

Metabolic syndrome (MetS) is an association of insulin resistance, high blood pressure, central obesity, arteriosclerosis, stroke, hyperlipoproteinemia, and heart infarction [1,2]. Met S is considered as lifestyle disorder because poor dieting and lack of regular physical activity lead to insulin resistance or insulin resistance-linked obesity, a condition where the body's cells are incapable of taking up glucose from the blood [3,4]. Visceral obesity, insulin resistance and chronic inflammation, is characterized by the production of abnormal adipocytokines such as tumor necrosis factor  $\alpha$ , interleukin-1 and 6, leptin, and adiponectin [3,5-8]. The proinflammatory state leads to a chronic, subclinical vascular inflammation which modulates and results in atherosclerotic processes [3]. Increasing age (greater than 40 years), cigarette smoking, alcohol intake, sedentary lifestyle, and family history of type 2 diabetes are the other triggering factors for Met S [5]. Arteriosclerosis is a consequence of components in Met S or can occur as an independent event in old age [5,9]. Arteriosclerosis leads to the thickening of the arterial wall which is the nidus for the formation of atheromatous plaque which can lead to a cerebrovascular accident if it occurs in cerebral vasculature [5,10,11]. If similar events occur in coronary blood vessels, it can lead to heart infarction. The present study was done to assess the level of knowledge, awareness of Met S and its complications. The present study is a part of the research project "study of knowledge and awareness of Met S among medical and paramedical students."

### METHODS

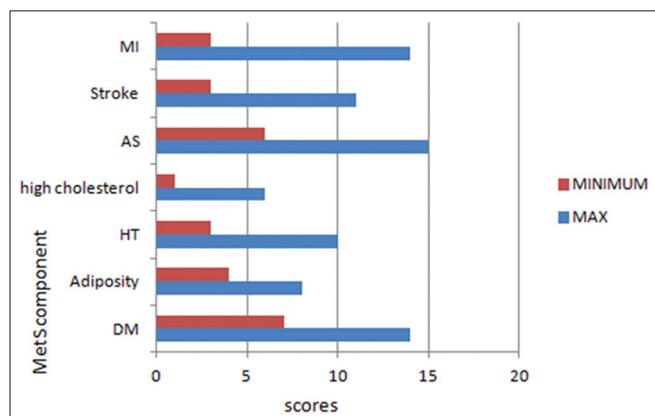
This is a cross-sectional descriptive study which was conducted on the physiotherapy students from Apollo College of Physiotherapy, Hyderabad, during the academic year 2017-18. The study was approved by the Research Committee of the Apollo Institute of Medical Sciences and Research. Out of 50 students admitted into 1<sup>st</sup> year BPT a total of 38 students studying 1<sup>st</sup> year physiotherapy (10 males and 28 females),

between 18 and 24 years were enrolled in the present study. Participants were informed about the content of the questionnaire before answering it. A written consent was taken from the students agreeing to participate in the present study. A self-administered pre-tested questionnaire which includes a total of 90 questions was given to the students. The questions were adapted from previous studies by Becker [12] and Yahia *et al.* [13]. The questionnaire was also validated by subject experts and some modifications were done according to faculty's suggestions. The questions were about various domains of Met S. All the students in the study voluntarily answered the questions. The questionnaire included 16 questions related to diabetes, nine related to adiposity, 12 hypertension related, six about high blood cholesterol, 17 linked to arteriosclerosis, 12 about stroke, and 18 related to myocardial infarction [12,13]. The response options to the questions will be "True" or "False." Students were instructed to fill the questionnaire truthfully. Each "correct" response was awarded one point and the "incorrect" and "do not know" responses were awarded zero points [12,13]. The maximum achievable total score for the Met S questions was 90. The percentage of correct response was calculated. Students' scores were graded into poor, fair, and good level of knowledge based on the percentage. If the percentages are  $\leq 50\%$  it is considered as poor knowledge, between 51 and 80% as fair knowledge and between 81 and 100% as good level of knowledge [12,13]. The difference in students response to the questionnaire was calculated by Fisher's exact test using "MedCalc Statistical Software version 16.4.3 (MedCalc Software bvba, Ostend, Belgium)". Results were expressed as mean  $\pm$  standard deviation (SD). p values were reported as two-sided and the statistical significance was defined by \* $p < 0.05$ , \*\* $p < 0.01$ .

### RESULTS

The present study was done to assess knowledge and awareness of Met S in undergraduate physiotherapy students. In our study, we assessed student's knowledge regarding precipitating factors,

biochemical process of metabolism, physical changes significant to Met S, consequences, and management of its components. In our present study, the highest overall individual score obtained was 64 out of 90. The maximum and minimum scores obtained in each component of Met S, Mean and SD, are represented in Table 1 and Graph 1.



Graph 1: The maximum and minimum scores obtained in each component of metabolic syndrome

Table 1: The maximum and minimum scores obtained in each component of metabolic syndrome, Mean and SD

Scores obtained	Diabetes mellitus	Adiposity	Hypertension	High cholesterol	Arteriosclerosis	Stroke	Myocardial infarction
Max	14	8	10	6	15	11	14
Minimum	7	4	3	1	6	3	3
Mean	9.96	6.06	6.93	3.09	11.15	6.56	10.9
SD	1.81	1.17	2.07	1.23	2.6	1.74	2.12

SD: Standard deviation

Table 2: The number and percentage of the male and female students with the correct response to a questionnaire for diabetes mellitus

S. No.	Questions	Key	Male (10)	Male %	Female (28)	Female %	Total (38)	Total %	p value
1.	There are several different types of diabetes	True	10	100	27	96	37	97	1
2.	Hereditary factors play a major role in the development of diabetes	True	8	80	28	100	36	94	0.16
3.	An increased alertness is a frequent symptom of diabetes	False	6	60	15	53	21	88	1
4.	Hereditary factors play only a minor role in the development of diabetes.	False	5	50	17	60	22	55	0.71
5.	Pregnant women have a reduced risk of acquiring diabetes	False	5	50	20	71	25	65	0.019*
6.	Eye disorders can be consequences of diabetes	True	5	50	22	78	27	71	0.094
7.	For some diabetics, it is not advisable to take insulin	True	9	90	24	85	33	86	1
8.	Diabetics may only eat special sweets for diabetics	True	5	50	22	78	27	71	0.116
9.	With diabetes, sugar cannot enter the cells sufficiently	True	4	40	8	28	12	31	0.694
10.	Poor appetite is a frequent symptom of diabetes	False	3	30	19	67	22	54	0.06
11.	With diabetes, too much sugar enters the cells	False	9	90	18	64	27	71	0.225
12.	Pregnant women have an increased risk of acquiring diabetes	True	5	50	25	89	30	78	0.019*
13.	Frequent urination is a frequent symptom of diabetes	True	8	80	27	96	35	92	0.164
14.	Diabetes patients must have insulin shots	False	6	60	8	28	14	36	0.127
15.	Arteriosclerosis is one of the sequelae of diabetes	True	6	60	13	46	19	50	0.714
16.	With diabetes, sugar cannot diffuse in the blood	False	9	90	16	57	25	65	0.118

\*p<0.05, \*\*p<0.01

Out of 90 questions, 16 questions were about diabetes mellitus. The number of students with the correct response and their percentages are represented in Table 2 and Graph 2. Thirty (78%) students ([50%] male and [89%] female) were aware that pregnant women have an increased risk of acquiring diabetes and difference in response between male and female participants is statistically significant (p=0.019).

Nine questions were related to adiposity. The number of students with correct response and their percentages is represented in Table 3 and Graph 3. About 84% of students were cognizant that adipose and non-adipose individuals do not have the same risk of suffering a stroke with a significant difference between male and female students (p=0.031).

A total of 73% of students (40% male and 85% female) were well aware that medication for hypertension cannot be discontinued (p=0.010). The number of students with the correct response and their percentages is represented in Table 4 and Graph 4.

The number of students with the correct response and their percentages, related to high blood cholesterol is represented in Table 5 and Graph 5.

The number of students with the correct response and their percentages to questionnaire for arteriosclerosis is represented in Table 6 and Graph 6.

The number of students with the correct response and their percentages to questionnaire for stroke is represented in Table 7 and Graph 7.

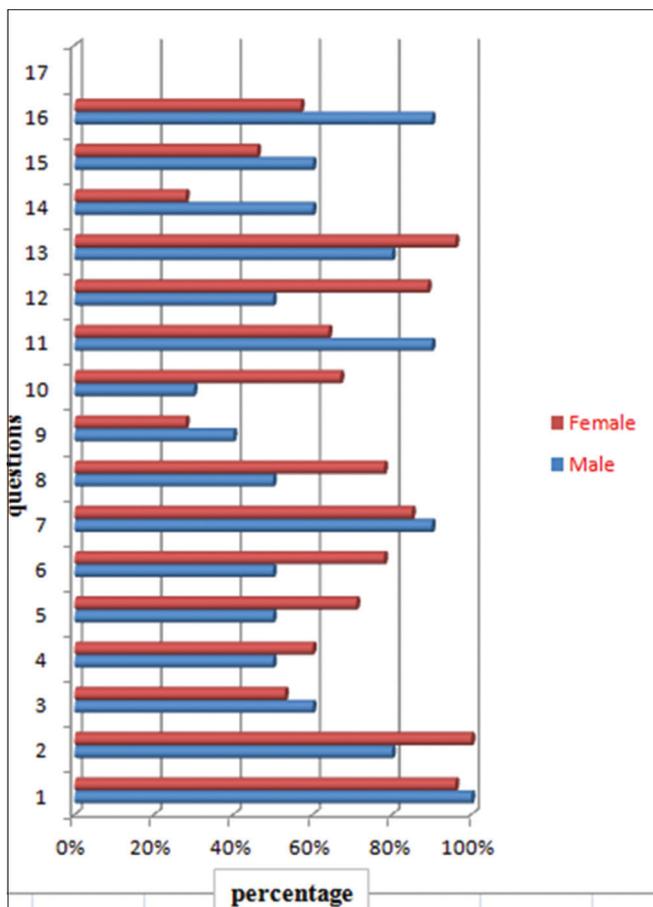
The number of students with the correct response and their percentages to questionnaire for myocardial infarction is represented in Table 8 and Graph 8.

A total of 76% of the students (50% male and 85% female) knew that in myocardial infarction, pain may radiate into the arms (p=0.036).

**DISCUSSION**

The questions on diabetes were about the types, precipitating causes, dietary factors, the biochemical mechanism of glucose uptake, symptoms, long-term consequences, and treatment. All most all (97%) the students showed good level of knowledge about the existence of several types of diabetes. Although most (94%) of the students know the importance of the role of hereditary factors, few of them muddled whether they play a major or a minor role. When compared to male, most of the female (89%) students showed a better level of knowledge about pregnancy-associated risk of diabetes (p=0.019). In contrast to increase of appetite in diabetes, students have better knowledge about frequent urination and decreased alertness as one of the symptom in diabetes. Regarding biochemical process involved in pathogenesis of diabetes as comprehended by the students, they could not appreciate what exactly materializes in diabetes. Most students exhibited good level of understanding about eyes disorders as a consequence of diabetes compared to arteriosclerosis. Students have average knowledge (71%) of what kind of sweets are to be taken in diabetes, this indicates they require more knowledge about diet and nutrition which plays an important role in regularizing the blood sugar levels and maintaining normal glycemia. Similar findings were observed in the work done by Becker [12] and Yahia et al. [13]. Although most of the students have an awareness that for some diabetics it is not advisable to take insulin, few of them were confused if diabetic patients must have insulin shots or not. Though they are in 1<sup>st</sup> year, as a part of increasing awareness in students and to avoid hypoglycemic episodes, it is very important to have the basic knowledge about insulin therapy.

Almost all the students (94%) were mindful that though excessive fat intake plays a key role as a causative factor, other factors also contribute to adiposity. A small number (39%) of students had the familiarity that adiposity and overweight are not synonyms. The fact that many students being ignorant that these two are not synonymous may be due to poor knowledge or the observance by the students the public usage of these terms as one and the same. When compared to male, most of the female students (92%) were cognizant that adipose individuals have an increased risk of suffering from stroke (p=0.031). Students were better knowledgeable about heart infarction as the risk of adiposity than about cessation of breathing during sleep and arteriosclerosis. Despite the fact that students know that adiposity can be treated surgically, the majority of them consider liposuction is the best mode of surgery which

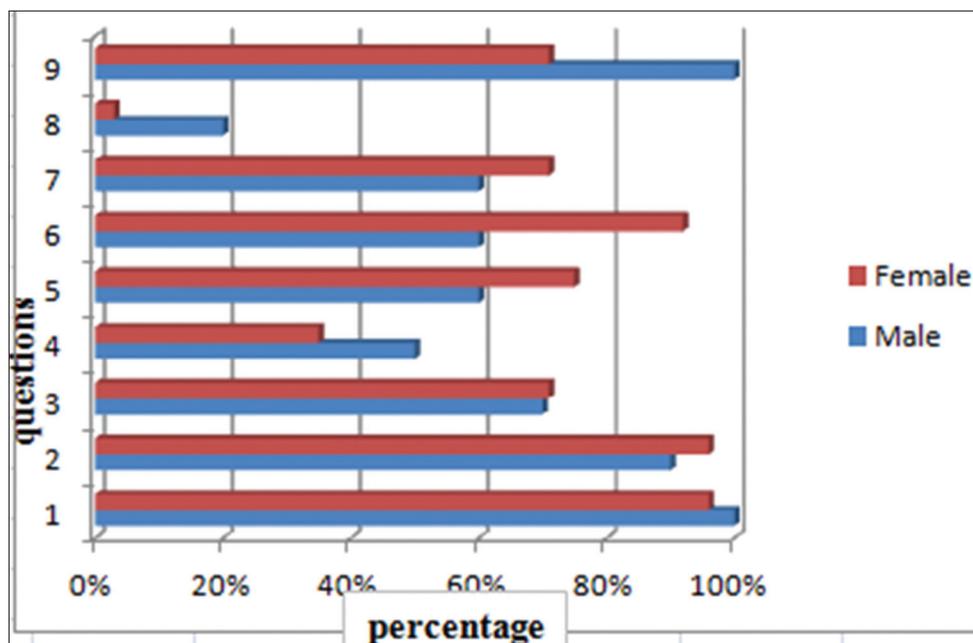


**Graph 2: The percentage of male and female students with the correct response to a questionnaire for diabetes mellitus**

**Table 3: The number and percentage of the male and female students with the correct response to a questionnaire for adiposity**

S. No.	Questions	Key	Male (10)	Male %	Female (28)	Female %	Total (38)	Total %	p value
1.	Adipose individuals have an elevated risk of suffering heart infarction	True	10	100	27	96	37	97	1
2.	Adiposity is not only caused by nutrition, other factors contribute as well	True	9	90	27	96	36	94	0.462
3.	An excessively fatty, high-caloric is the only factor that determines adiposity	False	7	70	20	71	27	71	1
4.	The terms "overweight" and "adiposity" are synonyms	False	5	50	10	35	15	39	0.473
5.	Cessation of breathing while sleeping is a possible consequence of adiposity	True	6	60	21	75	27	71	0.432
6.	Adipose individuals have the same risk than non-adipose individuals of suffering a stroke	False	6	60	26	92	32	84	0.031*
7.	Adipose individuals are more likely to suffer from arteriosclerosis	True	6	60	20	71	26	68	0.694
8.	Liposuction is a state-of-the-art treatment in adiposity therapy	False	2	20	1	3	3	7	0.164
9.	Adiposity can be treated surgically	True	10	100	20	71	30	78	0.082

\*p<0.05, \*\*p<0.01



Graph 3: The percentage of the male and female students with the correct response to a questionnaire for adiposity

Table 4: The number and percentage of the male and female students with the correct response to a questionnaire for hypertension

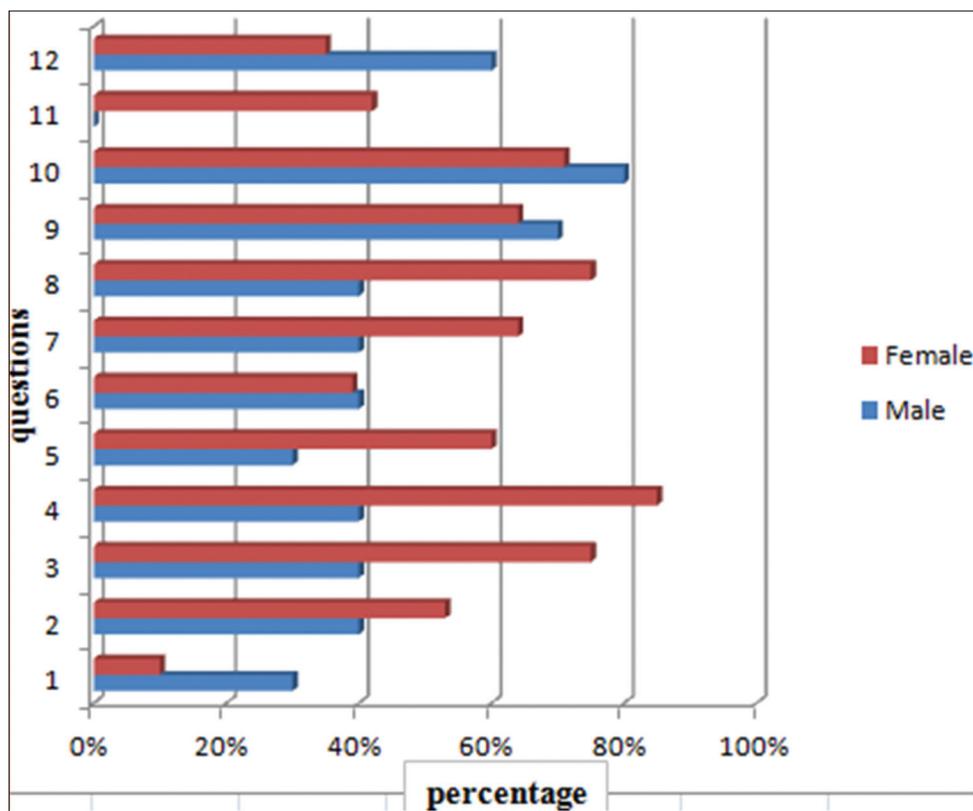
S. No.	Questions	Key	Male (10)	Male %	Female (28)	Female %	Total (38)	Total %	p value
1.	Hypertension is associated with heredity	True	3	30	3	10	6	15	0.310
2.	For the most part, a concrete single reason of why a patient suffers from hypertension can be determined	False	4	40	15	53	19	50	0.714
3.	Pregnant women are less likely to suffer from hypertension	False	4	40	21	75	25	65	0.062
4.	After the medication has lowered hypertension, the medication can usually be discontinued	False	4	40	24	85	28	73	0.010**
5.	People with hypertension are as likely to suffer from arteriosclerosis as those with normal hypertension	False	3	30	17	60	20	52	0.144
6.	Pregnant women are as likely to suffer from hypertension as non-pregnant women	False	4	40	11	39	15	39	1
7.	Individuals with hypertension are less likely to suffer from arteriosclerosis	False	4	40	18	64	22	57	0.438
8.	Hypertension can cause dizziness	True	4	40	21	75	25	65	0.116
9.	Hypertension can be caused by disorders of the thyroid gland	True	7	70	18	64	25	65	1
10.	Hypertension can cause renal damage	True	8	80	20	71	28	73	0.699
11.	Hypertension can lead to eye disorders	True	0	0	12	42	12	31	0.016*
12.	Hypertension can be caused by cerebral tumors	True	6	60	10	35	16	42	0.267

\*p<0.05, \*\*p<0.01

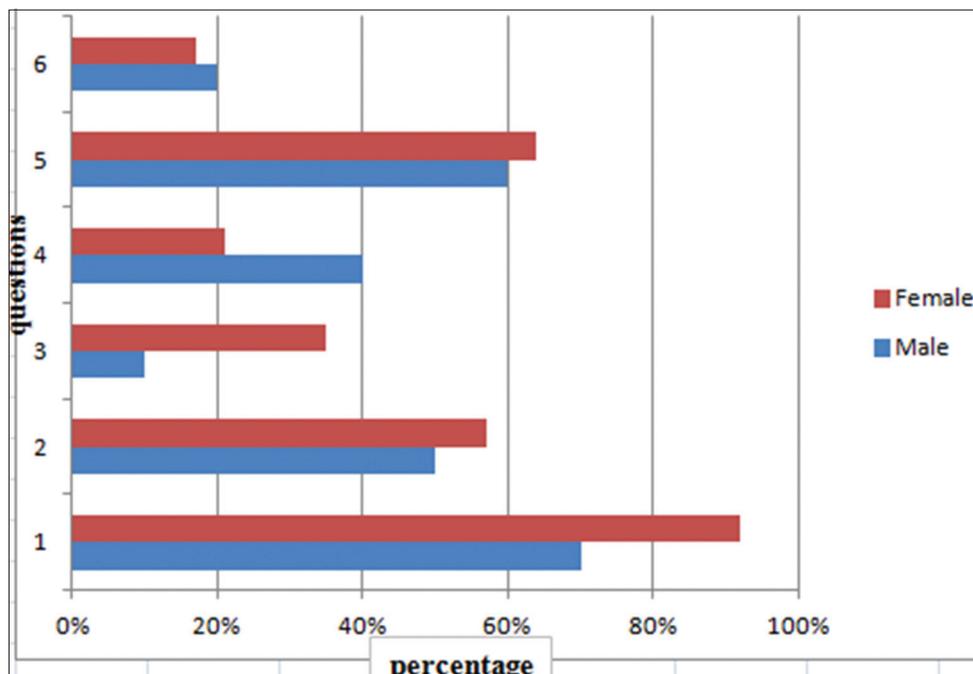
Table 5: The number and percentage of the male and female students with correct response to questionnaire for high blood cholesterol levels

S. No.	Questions	Key	Male (10)	Male %	Female (28)	Female %	Total (38)	Total %	p value
1.	A low cholesterol diet can supplement therapy for high blood cholesterol	True	7	70	26	92	33	86	0.10
2.	High blood cholesterol can be treated with medication	True	5	50	16	57	21	55	0.72
3.	High blood cholesterol does not cause acute ailments	True	1	10	10	35	11	28	0.22
4.	High blood cholesterol is not associated with hereditary factors	False	4	40	6	21	10	26	0.40
5.	High blood cholesterol promotes arteriosclerosis	True	6	60	18	64	24	63	1
6.	Fatigue is a frequent symptom of high blood cholesterol	False	2	20	5	17	7	18	1

\*p<0.05, \*\*p<0.01



Graph 4: The percentage of the male and female students with the correct response to a questionnaire for hypertension



Graph 5: The percentage of the male and female students with the correct response to a questionnaire for high blood cholesterol levels

is not. Due to the fact the commercials observed by them and lack of knowledge, the students might have presumed liposuction as the state of the art of treatment.

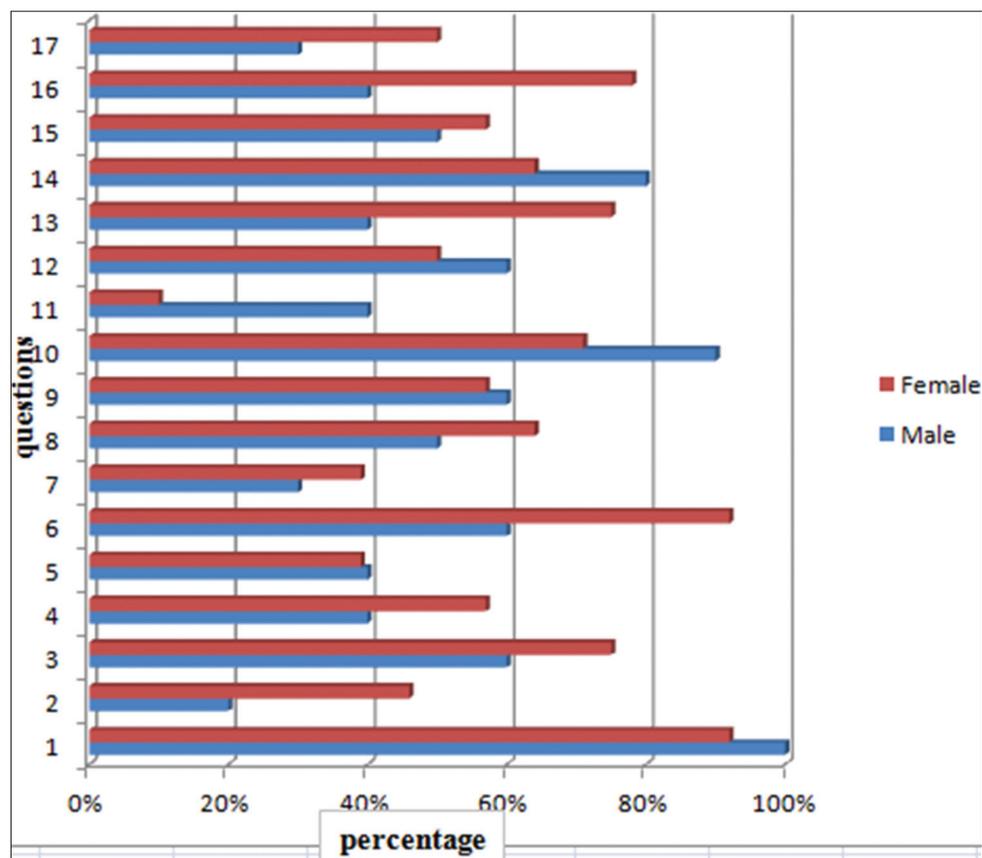
Surprisingly, students have poor knowledge about the risk factors of hypertension. Most of the students were also not able to correlate the increased risk of hypertension during pregnancy. They had a better understanding of thyroid disorders causing hypertension compared

to cerebral tumors and hereditary factors. Female students had more awareness than males that medication for hypertension cannot be discontinued and the difference in their response is statistically significant ( $p=0.010$ ). A total of 65% number of students know that hypertension can cause dizziness. The students were more knowledgeable about hypertension precipitating renal disorders than it causing eye disorders. Almost half of the participants (48%) could not understand the risk of arteriosclerosis in hypertensives compared to normotensive people.

**Table 6: The number and percentage of the male and female students with the correct response to a questionnaire for arteriosclerosis**

S. No.	Questions	Key	Male (10)	Male %	Female (28)	Female %	Total (38)	Total %	p value
1.	Arteriosclerosis increases the risk of suffering a stroke	True	10	100	26	92	36	94	1
2.	Leg pains are a symptom of arteriosclerosis	True	2	20	13	46	15	39	0.256
3.	With arteriosclerosis, arteries become softer	False	6	60	21	75	27	71	0.431
4.	Arteriosclerosis can be cured completely	False	4	40	16	57	20	52	0.468
5.	With arteriosclerosis, arteries contract	False	4	40	11	39	15	39	1
6.	With arteriosclerosis, arteries become less elastic	True	6	60	26	92	32	84	0.003**
7.	As a result of arteriosclerosis, blood pressure is likely to decline	False	3	30	11	39	14	36	0.714
8.	As a result of arteriosclerosis, blood pressure is likely to increase	True	5	50	18	64	23	60	0.472
9.	High blood pressure and arteriosclerosis are not linked with each other	False	6	60	16	57	22	57	1
10.	In arteriosclerosis, a sustainer can be inserted into the artery in order to stabilize it	True	9	90	20	71	29	76	0.395
11.	The risk of suffering from arteriosclerosis is not hereditary	False	4	40	3	10	7	18	0.006**
12.	Arteriosclerosis can cause renal damage	True	6	60	14	50	20	52	0.718
13.	With arteriosclerosis, blood platelets accumulate on the arterial walls	True	4	40	21	75	25	65	0.062
14.	With arteriosclerosis, fat accumulates on the arterial walls	True	8	80	18	64	26	68	0.452
15.	Individuals with high blood pressure are more likely to suffer from arteriosclerosis	True	5	50	16	57	21	55	0.726
16.	Medication can remove completely sediments from the arteries	False	4	40	22	78	26	68	0.045*
17.	With arteriosclerosis, arteries become brittle	True	3	30.00	14	50	17	44	0.46

\*p<0.05, \*\*p<0.01

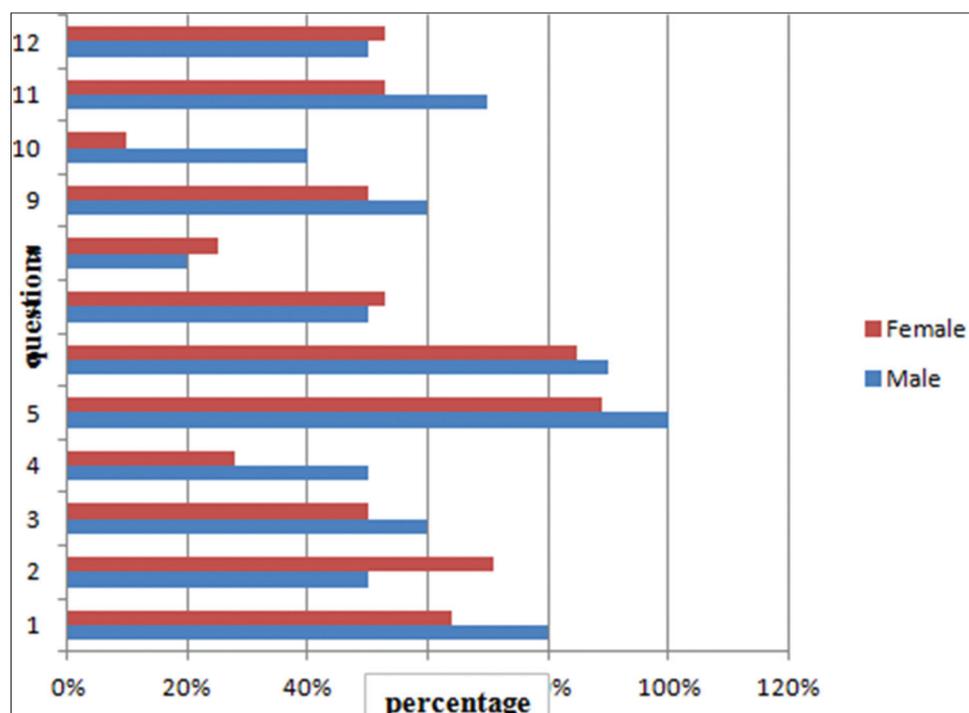


**Graph 6: The percentage of the male and female students with the correct response to a questionnaire for arteriosclerosis**

Table 7: The number and percentage of the male and female students with the correct response to a questionnaire for stroke

S. No.	Questions	Key	Male (10)	Male %	Female (28)	Female %	Total (38)	Total %	p value
1.	A stroke affects the brain	True	8	80	18	64	26	68	0.452
2.	If a patient survives a stroke, there are usually no permanent consequences	False	5	50	20	71	25	65	0.262
3.	Permanent speech defects are possible consequences of a stroke	True	6	60	14	50	20	52	0.718
4.	A stroke is often followed by memory dysfunction	True	5	50	8	28	13	34	0.262
5.	There are different types of strokes	True	10	100	25	89	35	92	0.551
6.	A stroke is caused by artery obstruction	True	9	90	24	85	33	86	1
7.	The nutrient supply to the brain is not affected by a stroke	False	5	50	15	53	20	52	1
8.	A stroke is characterized by a sudden dysfunction of the heart	False	2	20	7	25	9	23	1
9.	A stroke is caused when overexcited cells produce too much electricity	False	6	60	14	50	20	52	0.718
10.	A stroke is preceded frequently by chest pains	False	4	40	3	10	7	18	0.061
11.	A stroke is preceded frequently by speech problems	True	7	70	15	53	22	57	0.469
12.	Diabetics are more likely to suffer a stroke	False	5	50	15	53	20	52	1

\*p<0.05, \*\*p<0.01



Graph 7: The percentage of the male and female students with the correct response to a questionnaire for stroke

Physiotherapy students had good level of knowledge (86%) that a low cholesterol diet can supplement therapy for high blood cholesterol and fair knowledge (55%) that high blood cholesterol can be treated with medication. They had fair (63%) level of knowledge that high blood cholesterol can promote arteriosclerosis but poor knowledge (28%) that it cannot cause acute ailments. Only 18% of the participants were vigilant that fatigue is not it is a frequent symptom. Astonishingly, they were less familiar (26%) about the association of hereditary factors and high blood cholesterol.

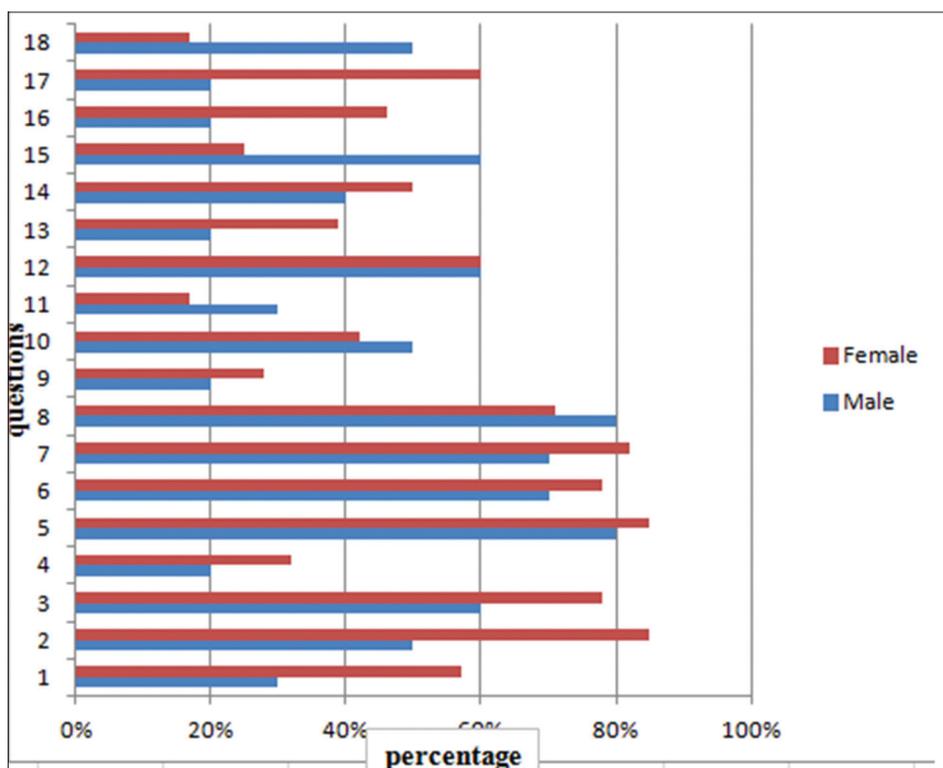
Almost all of them (94%) knew that arteriosclerosis increases the risk of stroke. Seventy-one percent of the participants were aware that in arteriosclerosis, arteries are not softer. Sixty percent of the male students were conscious about arteries becoming less elastic

in arteriosclerosis, and 92% of female participants were cognizant of this fact which is statistically significant (p=0.003). Even though the overall percentage did not reach good level of knowledge regarding the insertion of sustainer, 90% of male and 71% of female participants knew this fact. Surprisingly, only 18% of the students understood the role of heredity in arteriosclerosis and the response between males and females is statistically significant (p=0.006). Forty percent of males and 78% of females were informative that medication does not remove sediments completely and the difference between them is statistically significant (p=0.045). Students have fair knowledge (68%) about the effects of stroke on brain. Ninety-two percent of subjects have good knowledge about different types of stroke and 86% of participants were well aware that stroke is due to arteriolar obstruction. Only 57% of the students were conscious that stroke

**Table 8: The number and percentage of the male and female students with the correct response to a questionnaire for myocardial infarction**

S. No.	Questions	Key	Male (10)	Male %	Female (28)	Female %	Total (38)	Total %	p value
1.	Smoking is a minor risk factor with respect to a myocardial infarction	False	3	30	16	57	19	50	0.269
2.	When suffering a myocardial infarction, pain may radiate into the arms	True	5	50	24	85	29	76	0.036*
3.	The oxygen supply to the heart is not affected by a myocardial infarction	False	6	60	22	78	28	73	0.403
4.	Hereditary factors play a role in the risk of suffering a myocardial infarction	True	2	20	9	32	11	28	0.69
5.	After myocardial infarction, anticoagulants are administered	True	8	80	24	85	32	84	0.673
6.	Myocardial infarction is caused by cerebral dysregulation of the heart	False	7	70	22	78	29	76	0.673
7.	Myocardial infarction is often preceded by shortness of breath	True	7	70	23	82	30	78	0.411
8.	Myocardial infarction is caused by arterial obstruction	True	8	80	20	71	28	73	0.699
9.	Damage caused by myocardial infarction is not usually permanent	False	2	20	8	28	10	26	0.699
10.	After myocardial infarction has occurred, parts of the cardiac muscle tissue can die	True	5	50	12	42	17	44	1
11.	A heart infarction must be treated surgically	False	3	30	5	17	8	21	0.387
12.	With myocardial infarction cardiac muscle tissue dies	True	6	60	17	60	23	60	1
13.	Diabetes is a predisposing factor for myocardial infarction	True	2	20	11	39	13	34	0.441
14.	A heart infarction is typically followed by some degree of paralysis	False	4	40	14	50	18	51	0.718
15.	When suffering from myocardial infarction, pain may radiate into the stomach	True	6	60	7	25	13	34	0.062
16.	Myocardial infarction is caused by malfunction of one or more heart valves	False	2	20	13	46	15	39	0.258
17.	Myocardial infarction is usually preceded by loss of sensation and numbness	False	2	20	17	60	19	50	0.521
18.	Myocardial infarction can manifest itself through nausea and vomiting	True	5	50	5	17	10	26	0.09

\*p<0.05, \*\*p<0.01



**Graph 8: The percentage of the male and female students with the correct response to a questionnaire for myocardial infarction**

is preceded by speech problem. More than half of the participants showed a fair level of knowledge that diabetes cannot cause stroke. In this study, 50% of the participants knew that smoking is not a minor risk factor with respect to infarction. Students showed poor knowledge about symptoms such as nausea and vomiting in MI. They have fair knowledge about the fact that in MI pain may radiate to arms where the female students were more knowledgeable compared to males ( $p=0.03$ ). Surprisingly, most of the physiotherapy students have poor awareness about the role of hereditary and other predisposing factors like diabetes in MI.

### CONCLUSION

This study revealed knowledge about Met S among undergraduate physiotherapy students, which was inadequate. After graduation, these students will be subjected to provide their services to the society. Hence, this study emphasizes the need for improved clinical-based education and training in the teaching curriculum for physiotherapy students especially for lifestyle disorders like Met S.

### Limitations of the study

The study included only a small number of the participants it can be done in a large groups for effective results, as it is a self-reported questionnaire, biasing is common.

### AUTHORSHIP CRITERIA

The study was designed and conceptualized by Neha and Dr. Krishnaveni. Data collection data analysis, literature search, and manuscript preparation were also done by them.

Editing and reviewing were done by Dr. Krishnaveni. Soundarya contributed to data collection, analysis, and manuscript preparation. Shrivya Reddy assisted in the literature search.

### CONFLICTS OF INTEREST

There are no conflicts of interest.

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