

A Comparative Study of Atherosclerosis and Myocardial Infarction Knowledge among Pharmacy Students in Dharashiv, India

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ABSTRACT

Introduction: Atherosclerosis and myocardial infarction are significant contributors to cardiovascular morbidity and mortality worldwide. Understanding these conditions is crucial for healthcare professionals, including pharmacy students, who play a vital role in patient education and management. This study aimed to evaluate the knowledge of atherosclerosis and myocardial infarction among pharmacy students in Dharashiv, India and assess the impact of educational levels on their understanding of these conditions. **Materials and Methods:** A cross-sectional observational study was conducted at ASPM's K. T. Patil College of Pharmacy, Dharashiv, over a two-month period. A total of 346 pharmacy students were included in the study, with participants completing a self-administered questionnaire covering demographic details and assessment questions related to atherosclerosis and myocardial infarction. **Results:** Significant differences were observed in the knowledge of atherosclerosis and myocardial infarction between B.Pharm and Pharm.D students, with Pharm.D students demonstrating superior knowledge. Specific areas of difference included the relationship between atherosclerosis and stroke risk, symptoms and treatments of atherosclerosis and various aspects of myocardial infarction. **Conclusion:** This study highlights the need for tailored educational strategies to enhance pharmacy students' understanding of atherosclerosis and myocardial infarction. By addressing specific knowledge gaps, educational interventions can better prepare future healthcare professionals to prevent, diagnose and manage these conditions effectively. Further research is warranted to explore the effectiveness of different educational approaches in improving patient outcomes related to cardiovascular health.

Keywords: Atherosclerosis, Myocardial infarction, Pharmacy students, Cardiovascular disease, Education, Knowledge assessment.

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Received: 25-01-2024;

Revised: 16-02-2024;

Accepted: 02-04-2024.

INTRODUCTION

Atherosclerosis, a chronic inflammatory disease of large- and medium-sized arteries, begins in early adulthood and is driven by lipid accumulation, inflammation and vascular injury. It is the primary underlying process in the development of Coronary Artery Disease (CAD), with high serum cholesterol contributing significantly to plaque formation.¹ As atherosclerosis progresses, some plaques evolve to a more unstable phenotype with greater inflammation.²

The development of atherosclerosis in arterial walls, leading to complications such as chronic Coronary Heart Disease (CHD), acute Myocardial Infarction (MI) and ischemic stroke, remains

a leading cause of death and morbidity in Western industrialized countries.³ Eventually, plaque rupture can occur, leading to the formation of occlusive thrombi, resulting in the clinical manifestation of MI with angina pectoris, myocyte death and impaired cardiac function. Other coronary artery pathologies, such as plaque erosion or spontaneous coronary artery dissection, can also cause MI, although their frequency compared with plaque rupture is unclear and controversial, mainly based on a surprisingly low number of autopsy studies available.²

MI is a leading cause of death and disability in the developed world, typically resulting from the formation of an occlusive thrombus within a coronary artery, leading to cardiac ischemia and infarction.² Managing cholesterol levels and addressing atherosclerosis are crucial in reducing the risk of heart attacks.⁴

Preventing and treating MI faces several challenges, necessitating thorough research and breakthroughs in areas such as understanding plaque instability mechanisms, identifying



DOI: 10.5530/ijopp.17.3.39

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at-risk patients, identifying vulnerable plaques and developing approaches for plaque stabilization. Additionally, treatment and prevention of thrombotic occlusions and preventing Ischemia/Reperfusion (I/R) injury are crucial.²

Atherosclerotic plaques can impair vascular function, leading to arterial obstruction and tissue ischemia. Rupture of these plaques within a coronary artery can result in acute MI, responsible for significant morbidity and mortality worldwide.⁵ Despite advances in cardiovascular research, plaque rupture remains the leading cause of acute events, highlighting the high need for the development of plaque-stabilizing therapies.⁶

Most plaques remain asymptomatic (subclinical disease), some become obstructive (stable angina), but a few become thrombosis-prone (vulnerable), leading to atherothrombotic events such as MI and stroke.⁶ The risk of thrombosis depends more on plaque composition than on the degree of luminal obstruction seen by angiography, suggesting the potential for targeted therapy to reduce the risk of clinical events, although further research is needed in this area.⁷

This study aims to evaluate the atherosclerosis and MI knowledge among pharmacy students in Dharashiv, India. The hypothesis suggests no association between the course (B.Pharm/Pharm.D) and the correctness of student responses, while the alternative hypothesis proposes an association. By exploring nuanced aspects of atherosclerosis and MI knowledge, this study seeks to enhance understanding of these conditions among pharmacy students and inform future educational interventions.

MATERIALS AND METHODS

Study design, participants and study settings

A cross-sectional observational study was conducted at ASPM's K. T. Patil College of Pharmacy, Dharashiv, over a two-month period spanning from November to December 2023. Prior approval from the college's principal was obtained and the study's purpose was communicated to students, emphasizing voluntary participation. While Pharm.D first-year students and B.Pharm first and second-year students were excluded, participation was encouraged for B.Pharm third and fourth-year and Pharm.D second to sixth-year students. Students who declined to participate were not included in the study.

Sample size and sampling method

To ensure statistical robustness, a sample size of 246 was aimed for, considering varying class sizes. This included 125 students per year for B.Pharm (totaling 500 students across 4 years) and 30 students per year for Pharm.D (totaling 180 students across 6 years). Calculated with a 5% margin of error, a 95% confidence level and an anticipated response distribution of approximately 50%, this sample size guarantees reliable and representative

survey results. It aligns with the desired level of accuracy and confidence for the given population and response distribution.

Data collection tool

A self-administered questionnaire was given to 400 eligible pharmacy students, comprising B.Pharm third and fourth-year and Pharm.D second to sixth-year students. The questionnaire featured three sections covering participant details (gender, age, course and year), stroke and hypertension assessment questions.

Atherosclerosis and myocardial infarction assessments

For atherosclerosis and MI, twenty closed-ended questions (17 for atherosclerosis and 15 for MI) with response options of "true," "false," and "don't know" were used. Participants selected a single, correct response for each question.

Ethical considerations

Ethical committee approval for data collection was not required, as participants were college students and their involvement was voluntary. Moreover, no interventions aimed at influencing the study participants were implemented. Additionally, permission was obtained from the college principal.

RESULTS

Demographic details of participants

A total of 346 participants were included in this study, with 222 in the B. Pharm group and 124 in the Pharm.D group. The B. Pharm group showed balanced gender representation, with 111 female and 111 male students. In contrast, the Pharm.D group had a slight majority of males (63 students) compared to females (61 students). Participants from the 1st and 2nd years of the B. Pharm program and 1st year of Pharm.D were excluded. The majority, comprising 121 students, were in their 3rd year, while 101 students belonged to the 4th year of B. Pharm. In the Pharm.D program, 29 students were in their 2nd year, 19 in their 3rd year and 26 in their 4th year. Notably, the 5th year comprised 27 Pharm.D students, while the 6th year constituted 23 students. Table 1 presents the demographic distribution of participants, distinguishing between B. Pharm and Pharm.D students.

Assessment of pharmacy student's knowledge of atherosclerosis

Our study aimed to assess the understanding of atherosclerosis among pharmacy students, focusing on a range of questions to capture nuanced aspects of their knowledge. Table 2 displays participant's responses to the atherosclerosis questionnaire items, while Table 3 presents the percentage of correct responses for atherosclerosis with statistical interpretation. Figure 1 provides a graphical representation of participant's correct responses to the atherosclerosis questionnaire items. The results highlighted

Table 1: Demographic distribution of participants.

	B.Pharm students		Pharm.D students	
	n	%	n	%
Gender				
Female	111	50	61	49.19
Male	111	50	63	50.81
Total	222	100	124	100
Students				
2 nd Year	0	0	29	23.39
3 rd Year	121	54.50	19	15.32
4 th Year	101	45.50	26	20.97
5 th Year	-	-	27	21.77
6 th Year	-	-	23	18.55

Table 2: Participant's responses to atherosclerosis questionnaire items.

Sl. No.	Questions ⁸	Correct response	B.Pharm students, n=222			Pharm.D students, n=124		
			Correct response (n)	Incorrect response (n)	Don't know (n)	Correct response (n)	Incorrect response (n)	Don't know (n)
1	Arteriosclerosis increases the risk of suffering a stroke.	True	160	36	26	117	05	02
2	Leg pain is a symptom of arteriosclerosis.	True	28	77	117	62	55	07
3	In arteriosclerosis, arteries become softer.	False	69	124	29	91	26	07
4	Arteriosclerosis can be cured completely.	False	71	119	32	55	62	07
5	In arteriosclerosis, arteries contract.	False	77	116	29	17	102	05
6	In arteriosclerosis, arteries become less elastic.	True	116	79	27	91	26	07
7	As a result of arteriosclerosis, blood pressure is likely to decline.	False	77	115	30	70	48	06
8	As a result of arteriosclerosis, blood pressure is likely to increase.	True	125	63	34	87	35	02
9	High blood pressure and arteriosclerosis are not linked with each other.	False	73	117	32	71	44	09
10	In arteriosclerosis, a sustainer can be inserted into the artery in order to stabilize it.	True	99	90	33	83	24	17
11	The risk of developing arteriosclerosis is not hereditary.	False	74	112	36	55	60	09
12	Arteriosclerosis can cause renal damage.	True	110	79	33	76	45	03
13	In arteriosclerosis, blood platelets accumulate on the arterial walls.	True	120	71	31	86	35	03
14	In arteriosclerosis, fat accumulates on the arterial walls.	True	112	73	37	101	18	05
15	Individuals with high blood pressure are more likely to suffer from arteriosclerosis.	True	113	76	33	82	31	11
16	Medication can completely remove sediments from the arteries.	False	79	113	30	64	46	14
17	In arteriosclerosis, arteries become brittle.	True	110	73	39	55	57	12

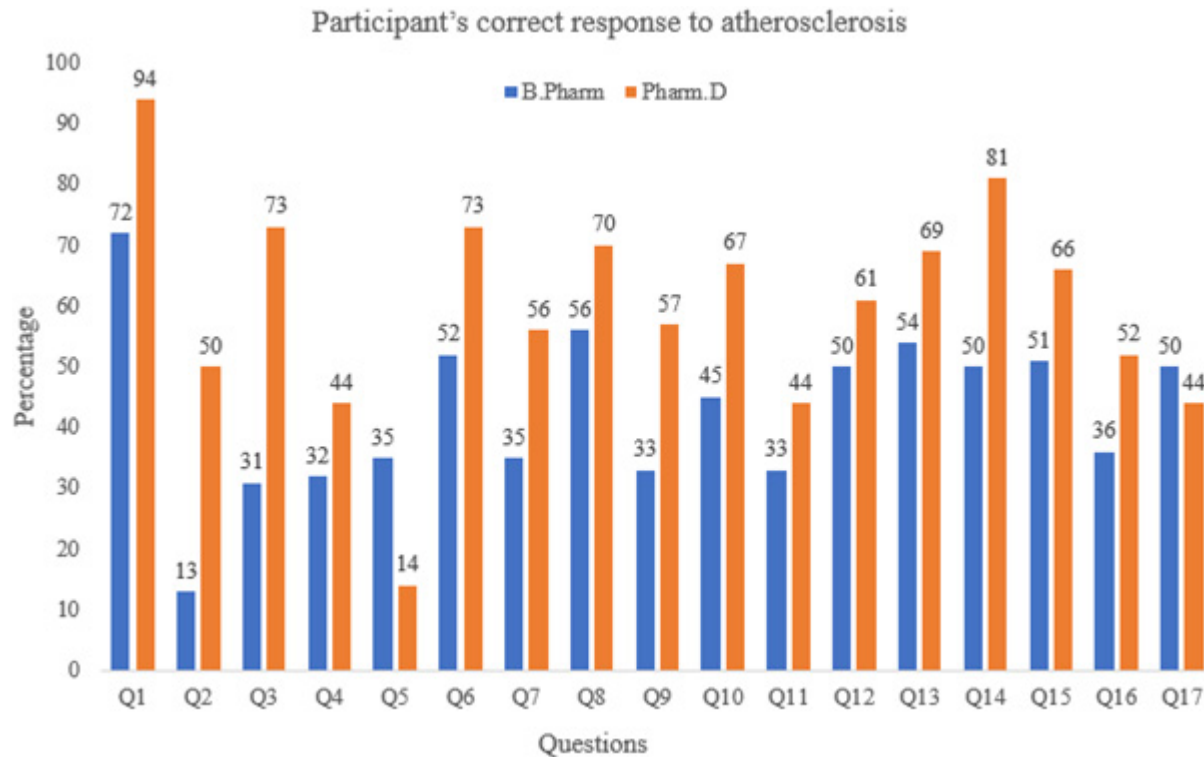


Figure 1: Participant's correct response to atherosclerosis questionnaire items.

Table 3: Percentage of correct response for atherosclerosis with statistical interpretation.

Question No.	Percentage of B.Pharm student's correct response	Percentage of Pharm.D student's correct response	Chi-squared Statistic	Degrees of Freedom	p-value	Result
1	72	94	2.2949E-189	2	0.05	Significant
2	13	50	3.3735E-169	2	0.05	Significant
3	31	73	1.1566E-183	2	0.05	Significant
4	32	44	5.5551E-111	2	0.05	Significant
5	35	14	7.4699E-125	2	0.05	Significant
6	52	73	1.481E-118	2	0.05	Significant
7	35	56	7.2168E-105	2	0.05	Significant
8	56	70	2.43889E-93	2	0.05	Significant
9	33	57	8.07452E-96	2	0.05	Significant
10	45	67	3.2353E-106	2	0.05	Significant
11	33	44	5.71429E-83	2	0.05	Significant
12	50	61	1.16385E-93	2	0.05	Significant
13	54	69	1.11348E-97	2	0.05	Significant
14	50	81	9.02918E-87	2	0.05	Significant
15	51	66	2.996E-50	2	0.05	Significant
16	36	52	1.09036E-33	2	0.05	Significant
17	50	44	3.71045E-12	2	0.05	Significant

Note: The "E" represents "exponent" and is used to indicate a number multiplied by 10 raised to a certain power. For example, in the number 2.2949E-189, "E-189" means the decimal point is moved 189 places to the left, making the number very small.

Table 4: Participant's responses to myocardial infarction questionnaire items.

S1. No.	Questions ⁹	Correct response	B.Pharm students, n=222			Pharm.D students, n=124		
			Correct response (n)	Incorrect response (n)	Don't know (n)	Correct response (n)	Incorrect response (n)	Don't know (n)
1	Smoking is a minor risk factor with respect to myocardial infarction.	False	59	125	38	39	81	04
2	When suffering a myocardial infarction, pain may radiate to the arms.	True	110	75	37	91	26	07
3	The oxygen supply to the heart is not affected by a myocardial infarction.	False	75	107	40	56	64	04
4	Hereditary factors play a role in the risk of suffering a myocardial infarction.	True	115	75	32	78	45	01
5	After myocardial infarction, anticoagulants are administered.	True	108	71	43	78	38	08
6	A myocardial infarction is often preceded by shortness of breath.	True	118	70	34	95	24	05
7	A myocardial infarction is caused by arterial obstruction.	True	111	78	33	94	25	05
8	Damage caused by a myocardial infarction is not usually permanent.	False	70	113	39	51	66	07
9	After a myocardial infarction, parts of cardiac muscle tissue can die.	True	112	76	34	82	34	08
10	A myocardial infarction must be treated surgically.	False	67	120	35	35	81	08
11	In myocardial infarction, cardiac muscle tissue dies.	True	114	70	38	82	37	05
12	Diabetes is a predisposing factor for myocardial infarction.	True	122	66	34	69	47	08
13	When suffering a myocardial infarction, pain may radiate to the stomach.	True	104	79	39	48	63	13
14	A myocardial infarction is usually preceded by loss of sensation and numbness.	False	68	119	35	41	72	11
15	A myocardial infarction can manifest itself through nausea and vomiting.	True	106	80	36	65	50	09

significant differences in correct responses between B. Pharm and Pharm.D students, indicating the influence of educational levels on the depth of understanding.

For example, the question addressing the relationship between atherosclerosis and stroke risk (Question 1) revealed a substantial difference in correct responses, with 72% of B.Pharm students and 94% of Pharm.D students providing correct answers. This disparity underscores the impact of educational advancement on the understanding of how atherosclerosis contributes to stroke risk.

Similarly, questions related to symptoms and treatments of atherosclerosis showed notable differences. For instance, the question about leg pain as a symptom (Question 2) and the

effectiveness of medication in removing arterial sediments (Question 16) demonstrated significant variation in correct responses between the two student groups. These findings emphasize the need for tailored educational approaches to address specific knowledge gaps in these areas.

Furthermore, inquiries into the association between atherosclerosis and other health conditions, such as renal damage (Question 12) and the accumulation of blood platelets on arterial walls (Question 13), revealed pronounced differences in correct responses. These results highlight the importance of educational interventions to enhance pharmacy students' understanding of the complexities of atherosclerosis and its implications for various health outcomes.

Assessment of pharmacy student's knowledge of myocardial infarction

Interpreting the results from the tables for MI, we can see that there is a clear difference in the responses between B.Pharm

and Pharm.D students across various questions related to MI knowledge. Table 4 displays participant's responses to the myocardial infarction questionnaire items, while Table 5 presents the percentage of correct responses for myocardial infarction

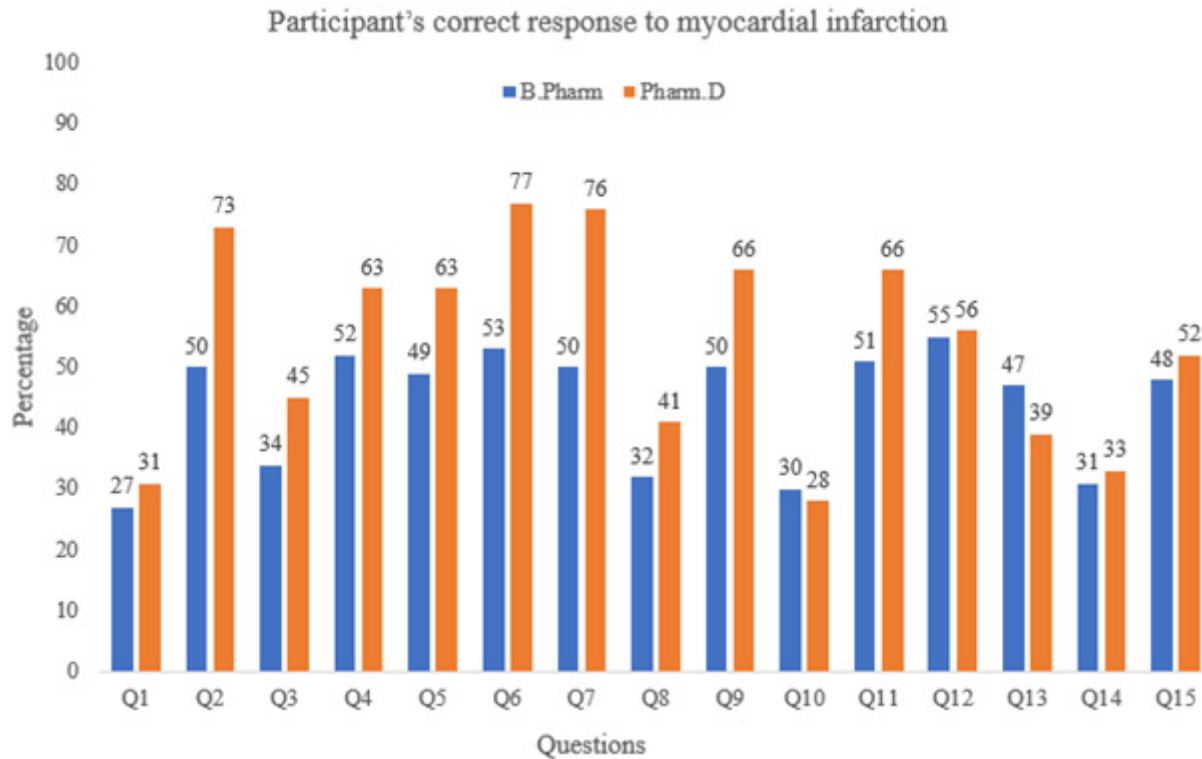


Figure 2: Participant's correct response to myocardial infarction questionnaire items.

Table 5: Percentage of correct response for myocardial infarction with statistical interpretation.

Question No.	Percentage of B.Pharm student's correct response	Percentage of Pharm.D student's correct response	Chi-squared Statistic	Degrees of Freedom	p-value	Result
1	27	31	1.59114E-51	2	0.05	Significant
2	50	73	2.28545E-64	2	0.05	Significant
3	34	45	1.71094E-68	2	0.05	Significant
4	52	63	1.28407E-69	2	0.05	Significant
5	49	63	4.4203E-75	2	0.05	Significant
6	53	77	8.97058E-77	2	0.05	Significant
7	50	76	1.37185E-65	2	0.05	Significant
8	32	41	3.89122E-51	2	0.05	Significant
9	50	66	2.36728E-57	2	0.05	Significant
10	30	28	2.99872E-54	2	0.05	Significant
11	51	66	2.37738E-53	2	0.05	Significant
12	55	56	2.51558E-44	2	0.05	Significant
13	47	39	6.25384E-34	2	0.05	Significant
14	31	33	4.22661E-19	2	0.05	Significant
15	48	52	6.85499E-09	2	0.05	Significant

Note: The "E" stands for "exponent." It is used to represent a number multiplied by 10 raised to a certain power. For example, 1.59114E-51 is equal to 1.59114 x 10⁻⁵¹.

with statistical interpretation. Figure 2 provides a graphical representation of participant's correct responses to the myocardial infarction questionnaire items.

For instance, in Question 1, which addresses smoking as a minor risk factor for MI, 59% of B.Pharm students answered correctly compared to 81% of Pharm.D students. This significant difference suggests a higher level of understanding among Pharm.D students regarding this aspect of MI.

A similar trend is observed in Question 2, where 110 B.Pharm students (50%) correctly identified that pain may radiate to the arms during an MI, while 91 (73%) Pharm.D students gave the correct response. This pattern continues in Questions 3 to 15, with Pharm.D students consistently outperforming B.Pharm students in terms of correct responses.

The statistical analysis further confirms these observations, showing significant differences in the percentage of correct responses between the two groups for each question. The chi-squared statistic, degrees of freedom and *p*-values indicate that these differences are statistically significant.

Overall, these results highlight the superior knowledge of Pharm.D students compared to B.Pharm students when it comes to various aspects of MI. This suggests that the Pharm.D curriculum may be more effective in educating students about MI, emphasizing the importance of tailored educational strategies to address specific knowledge gaps in pharmacy curricula related to cardiovascular diseases like MI.

CONCLUSION

This study provides valuable insights into the knowledge of atherosclerosis and myocardial infarction among pharmacy students in Dharashiv, India. The findings underscore the importance of educational interventions to enhance understanding and promote comprehensive knowledge of these conditions among pharmacy students.

Our results indicate significant differences in the understanding of atherosclerosis and myocardial infarction between B.Pharm and Pharm.D students, highlighting the influence of educational levels on knowledge depth. Specifically, Pharm.D students' demonstrated superior knowledge compared to B.Pharm students, particularly in areas such as the relationship between atherosclerosis and stroke risk and various aspects of myocardial infarction.

These findings emphasize the need for tailored educational strategies to address specific knowledge gaps in pharmacy curricula. By enhancing pharmacy students' understanding of atherosclerosis and MI, educational interventions can play a crucial role in preparing future healthcare professionals to effectively prevent, diagnose and manage these conditions.

Overall, this study contributes to the growing body of literature on cardiovascular disease education among healthcare professionals. It highlights the importance of continuous education and training to improve healthcare outcomes related to atherosclerosis and MI. Further research is warranted to explore the effectiveness of different educational approaches in enhancing knowledge and improving patient outcomes in the field of cardiovascular health.

ACKNOWLEDGEMENT

The authors express their gratitude to Ms. Swati Pawar, Assistant Professor in the Department of Pharmaceutical Chemistry, as well as to the principal and management of ASPM's K. T. Patil College of Pharmacy, Dharashiv, for their valuable support.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

B.Pharm: Bachelor of Pharmacy; **CAD:** Coronary artery disease; **CHD:** Coronary heart disease; **I/R:** Ischemia/reperfusion; **MI:** Myocardial infarction; **Pharm.D:** Doctor of Pharmacy; **WHO:** World Health Organization.

SUMMARY

The study aimed to assess the knowledge of atherosclerosis and Myocardial Infarction (MI) among pharmacy students in Dharashiv, India, comparing B.Pharm and Pharm.D students. A total of 346 participants were included, with significant differences observed in correct responses between the two groups. Pharm.D students demonstrated superior knowledge, particularly in understanding the relationship between atherosclerosis and stroke risk and various aspects of MI. The findings highlight the need for tailored educational strategies to address knowledge gaps and prepare future healthcare professionals effectively. The study contributes valuable insights to cardiovascular disease education, emphasizing the importance of continuous education and training for better patient outcomes.

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Cite this article: Kashyap S, Jha D, Hangargekar P, Ram P, Joshi A, Jain A. A Comparative Study of Atherosclerosis and Myocardial Infarction Knowledge among Pharmacy Students in Dharashiv, India. Indian J Pharmacy Practice. 2024;17(3):241-8.