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Original Article

Comparative Analysis of Stroke and Hypertension Knowledge among Pharmacy Students in Dharashiv, India: A Cross-sectional Investigation

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ABSTRACT

Introduction: Stroke is a rapid and sustained disturbance of cerebral function, and is a global health concern, with 80% of cases being ischemic strokes. Both non-modifiable (age, sex, race-ethnicity, genetics) and modifiable factors (hypertension, diabetes, hyperlipidemia, smoking) contribute to stroke risk, with hypertension as a primary risk factor. This study explores the association between course (B.Pharm/Pharm.D) curriculum and student's knowledge about stroke and hypertension, emphasizing the understanding of pathogenesis, risk factors, and management. **Materials and Methods:** A cross-sectional observational study at ASPM's K. T. Patil College of Pharmacy included 346 participants. Ethical considerations were addressed, and a self-administered questionnaire assessed pharmacy Student's knowledge of stroke and hypertension. Twenty close-ended questions with response options of "true," "false," and "don't know" were used. **Results:** Demographic details revealed differences between B.Pharm and Pharm.D groups. The study showcased variations in hypertension-related knowledge, emphasizing the influence of education levels. Stroke-related knowledge demonstrated commendable correctness rates, with generally similar levels between the two groups. The findings offer insights for refining educational strategies and addressing knowledge gaps in college pharmacy curricula. **Conclusion:** Our investigation highlights patterns and disparities in pharmacy Student's knowledge of stroke and hypertension. Tailored educational strategies are crucial for a comprehensive understanding, especially regarding hypertension, a significant modifiable risk factor for stroke. Proactive measures, including targeted modules and practical training, are recommended for future pharmacists to contribute effectively to stroke and hypertension prevention and management.

Keywords: Stroke, Hypertension, Pharmacy Education, Knowledge Disparities, Cardiovascular Health.

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INTRODUCTION

Stroke, as defined by the World Health Organization (WHO), is a rapidly developing clinical sign of focal or global disturbance of cerebral function lasting for greater than 24 hr or resulting in death, primarily of vascular origin.[1] Categorized into ischemic and hemorrhagic types, stroke is a leading global health concern, with 80% being ischemic.[2] Both non-modifiable and modifiable risk factors contribute to stroke occurrence. Non-modifiable factors encompass age, sex, race-ethnicity, and genetics, while modifiable factors such as Hypertension (HTN), diabetes, hyperlipidemia, and smoking play a pivotal role. Notably, HTN stands out as the most prominent risk factor for stroke, with individuals having HTN being 3-4 times more likely to suffer from stroke than those without.[3]

Hypertension, characterized by high Blood Pressure (BP) exceeding 140/90 mmHg, poses a common yet potentially serious health concern if left untreated. Regular BP monitoring is essential, as individuals with this condition may not experience noticeable symptoms. Contributing factors to an increased susceptibility to high BP include advancing age, a genetic predisposition, being overweight or obese, insufficient physical activity, adherence to a high-salt diet, and excessive alcohol consumption. Active recognition and management of these risk factors are crucial to mitigate the potential adverse effects associated with HTN.[4]

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The intricate relationship between stroke and HTN highlights the crucial role of hypertension as a key risk factor.[5] High BP signifies increased stress on the heart, weakening arterial strength and rendering them susceptible to blockages or ruptures, culminating in ischemic or hemorrhagic strokes.[6] The pathogenesis of HTN-induced stroke involves prolonged elevation in BP, leading to alterations in cerebral blood vessels, oxidative stress, and subsequent HTN.[3] Oxidative stress, characterized by an imbalance between reactive oxygen species (free radicals) and antioxidant defenses, triggers proinflammatory genes, including cytokines and adhesion molecules, contributing to cerebral damage during ischemic stroke.[7,8] Inflammation emerges as a biomarker predicting the risk of primary ischemic stroke, while arterial baroreflex dysfunction plays a crucial role in vascular changes and HTN-related complications.[3]

Ischemic stroke results from the occlusion of intracranial or cervical arteries, obstructing blood and oxygen supply to the brain, while hemorrhagic stroke arises from blood vessel ruptures in the brain.[5,6] Managing HTN becomes imperative in reducing the risk of stroke.[9] Screening and treating HTN are pivotal steps in decreasing cardiovascular disease risk, with evidence supporting the reduction of stroke risk by maintaining BP levels below 150/90 mmHg. The complex nature of BP management in stroke patients necessitates therapeutic goals and accurate diagnosis due to heterogeneous causes and hemodynamic consequences.[5] Elevated BP is a common occurrence after a stroke, further exacerbating hemodynamic consequences and contributing to the complexity of BP management.[10]

Stroke poses a significant global health challenge, being a major cause of disabilities and death. Hypertension emerges as a crucial modifiable risk factor, tightly linked to stroke incidence. Controlling BP proves pivotal in reducing the risk of stroke, emphasizing the importance of regular BP monitoring. Lifestyle modifications, including physical exercise, proper diet management, smoking cessation, and pharmacological interventions, play pivotal roles in improving the overall condition. The hypothesis for this study posits that there is no association between the course (B.Pharm/Pharm.D) and the correctness of student's responses. The alternative hypothesis suggests that there is an association between the course (B.Pharm/Pharm.D) and the correctness of student's responses. The study aimed to investigate the association between course (B.Pharm/Pharm.D) and the correctness of Student's responses, focusing on nuanced aspects of stroke and HTN knowledge.

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 four years) and 30 students per year for Pharm.D (totaling 180 students across six 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 HTN assessment questions.

Stroke and hypertension assessments

For stroke and HTN, twenty closed-ended questions (10 for stroke and 10 for HTN) 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 AND DISCUSSION

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 hypertension

In our investigation into HTN-related knowledge among pharmacy students, we explored ten distinct questions to grasp nuanced aspects of their understanding. Table 2 displays participant's responses to the hypertension questionnaire items, while Table 3 presents the percentage of correct responses for hypertension with statistical interpretation. Figure 1 provides a graphical representation of participant's correct responses to the hypertension questionnaire items. Notably, the question addressing the hereditary association of HTN (Question 1) revealed a significant difference in correct responses between B.Pharm and Pharm.D students, recording 67% and 64%, respectively. This disparity signified a significant association between the level of education and the correctness of responses. A parallel pattern emerged in subsequent inquiries, such as the determination of a singular reason for HTN (Question 2) and the potential discontinuation of medication post-HTN reduction (Question 3), where B.Pharm and Pharm.D students exhibited significant differences in correct responses, 34% vs. 28% and 36% vs. 53%, respectively. These outcomes underscore the substantial influence of the level of education on the correctness of responses within these specific domains of HTN knowledge.

Similarly, questions probing into the relationship between HTN and arteriosclerosis (Questions 4 and 5) demonstrated notable differences in correct responses between the two student groups, emphasizing the significant association between educational levels and the correctness of responses. As we explored diverse facets of HTN, encompassing its impact on dizziness (Question 6), causes linked to thyroid gland disorders (Question 7), renal damage (Question 8), eye disorders (Question 9), and cerebral tumors (Question 10), the observed differences in correct responses reaffirmed the consequential role of education levels in shaping HTN-related knowledge among pharmacy students. These nuanced findings hold implications for tailored educational strategies that address specific knowledge gaps within pharmacy curricula.

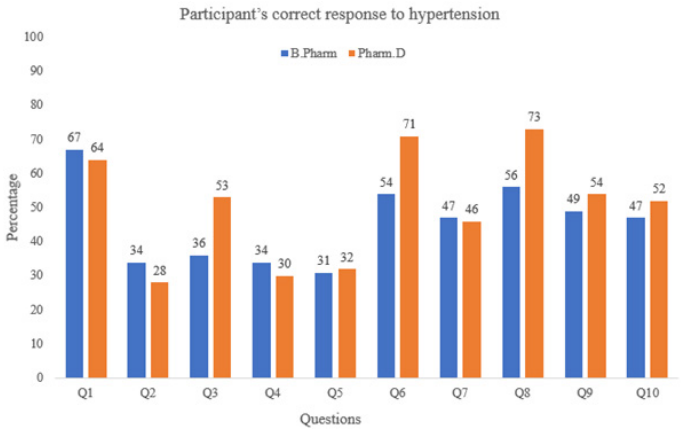

Figure 1: Participant's correct response to hypertension questionnaire items.

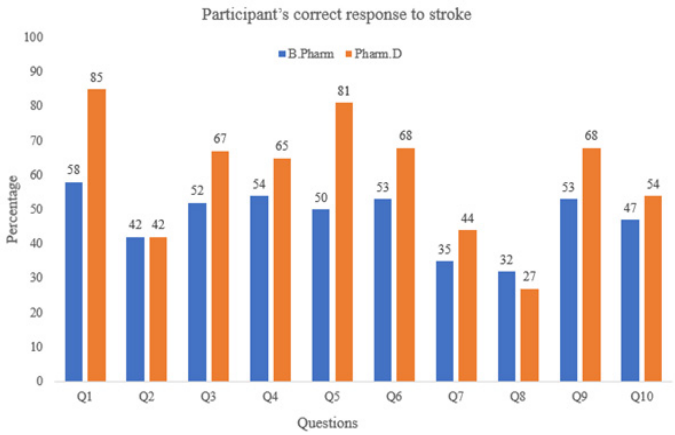

Figure 2: Participant's correct response to stroke questionnaire items.

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				
2nd year	0	0	29	23.39
3rd year	121	54.50	19	15.32
4th year	101	45.50	26	20.97
5th year	-	-	27	21.77
6th year	-	-	23	18.55

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

Sl. No.	Questions[11]	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	Hypertension is associated with heredity.	True	149	55	18	79	40	5
2	For the most part, a single concrete reason of why a patient suffers from hypertension can be determined.	False	75	110	37	35	82	7
3	After medication has reduced the hypertension, the medication can usually be discontinued.	False	81	105	36	66	56	2
4	People with hypertension are as likely to suffer from arteriosclerosis as those with normal blood pressure.	False	75	116	31	37	81	6
5	Individuals with hypertension are less likely to suffer from arteriosclerosis.	False	68	122	32	40	72	12
6	Hypertension can cause dizziness.	True	119	76	27	88	34	2
7	Hypertension can be caused by disorders of the thyroid gland.	True	105	80	37	57	56	11
8	Hypertension can cause renal damage.	True	125	67	30	90	33	1
9	Hypertension can lead to eye disorders.	True	109	77	36	67	53	4
10	Hypertension can be caused by cerebral tumors.	True	104	78	40	64	51	9

Table 3: Percentage of correct response for hypertension 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	67	64	52.69	2	3.676e-12 (<0.05)	Significant association
2	34	28	68.85	2	1.087e-15 (<0.05)	Significant association
3	36	53	37.86	2	5.912e-09 (<0.05)	Significant association
4	34	30	16.19	2	0.0003044 (<0.05)	Significant association
5	31	32	13.49	2	0.001189 (<0.05)	Significant association
6	54	71	23.48	2	8.084e-06 (<0.05)	Significant association
7	47	46	5.19	2	0.0746 (<0.05)	No significant association
8	56	73	34.48	2	3.250e-08 (<0.05)	Significant association
9	49	54	7.19	2	0.0273 (<0.05)	Significant association
10	47	52	10.94	2	0.00427 (<0.05)	Significant association

Assessment of pharmacy student's knowledge of stroke

In the evaluation of stroke-related knowledge among pharmacy students, our investigation probed into ten specific questions, each designed to assess distinct facets of understanding. Table 4 displays participant's responses to the stroke questionnaire items, while Table 5 presents the percentage of correct responses for stroke with statistical interpretation. Figure 2 provides a

Table 4: Participant's responses to stroke questionnaire items.

Sl. No.	Questions[12]	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	A stroke affects the brain.	True	128	70	24	106	16	2
2	If a patient survives a stroke, there are usually no permanent consequences.	False	93	103	26	52	60	12
3	Permanent speech defects are possible consequences of a stroke.	True	115	67	40	83	36	5
4	A stroke is often followed by memory dysfunction.	True	120	70	32	80	33	11
5	There are different types of strokes.	True	112	75	35	100	22	2
6	A stroke is caused by arterial occlusion.	True	118	72	32	84	29	11
7	The nutrient supply to the brain is not affected by a stroke.	False	78	115	29	54	65	5
8	A stroke is frequently preceded by chest pain.	False	72	114	36	34	81	9
9	A stroke is frequently preceded by speech problems.	True	117	69	36	84	36	4
10	Individuals with diabetes are more likely to suffer a stroke.	True	105	82	35	67	44	13

Table 5: Percentage of correct response for stroke 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	58	85	1.42	2	0.491 (≥0.05)	No significant association
2	42	42	4.15	2	0.126 (≥0.05)	No significant association
3	52	67	0.40	2	0.819 (≥0.05)	No significant association
4	54	65	0.44	2	0.801 (≥0.05)	No significant association
5	50	81	0.35	2	0.841 (≥0.05)	No significant association
6	53	68	0.40	2	0.819 (≥0.05)	No significant association
7	35	44	13.51	2	0.001 (<0.05)	Significant association
8	32	27	30.29	2	2.556e-07 (<0.05)	Significant association
9	53	68	0.40	2	0.819 (≥0.05)	No significant association
10	47	54	1.64	2	0.441 (≥0.05)	No significant association

graphical representation of participant's correct responses to the stroke questionnaire items. Notably, in response to the query regarding the fundamental impact of stroke on the brain (Question 1), both B.Pharm and Pharm.D students demonstrated commendable correctness rates, recording 58% and 85%, respectively. Nevertheless, the statistical analysis revealed no significant association between the course (B.Pharm/Pharm.D) and the correctness of responses for this particular question. A similar trend persisted across various inquiries, including the consideration of permanent consequences following a stroke (Question 2), where comparable correctness rates of 42% for B.Pharm and 42% for Pharm.D were observed, without significant differences tied to course (B.Pharm/Pharm.D).

Likewise, questions exploring the likelihood of speech defects after a stroke (Question 3) and the occurrence of memory dysfunction post-stroke (Question 4) mirrored this pattern, with no statistically significant associations between course (B.Pharm/Pharm.D) and correctness of responses. Although specific discrepancies surfaced in the understanding of certain aspects, such as the impact of stroke on nutrient supply to the brain (Question 7) and the preceding symptom of chest pain (Question 8), the overall analysis suggests a generally similar level of stroke-related knowledge between B.Pharm and Pharm.D students. These nuanced findings offer valuable insights for refining stroke education strategies within pharmacy curricula, targeting specific areas where knowledge gaps may persist among future pharmacy professionals.

CONCLUSION

In conclusion, our cross-sectional investigation into the knowledge of stroke and HTN among pharmacy students has revealed insightful patterns and educational disparities. The study provides a comprehensive analysis of pharmacy Student's awareness of these critical areas of cardiovascular health.

Our findings indicate that the course (B.Pharm/Pharm.D) significantly shapes Student's understanding of HTN-related nuances. The comparative analysis of correct responses between B.Pharm and Pharm.D students across ten distinct questions highlighted substantial differences in specific domains of HTN knowledge. These variations underscore the need for tailored educational strategies to address knowledge gaps within college pharmacy curricula, ensuring that future professionals possess a comprehensive understanding of HTN and its various facets.

Similarly, our investigation into stroke-related knowledge revealed commendable correctness rates among both B.Pharm and Pharm.D students. While some specific discrepancies emerged in understanding certain aspects, the overall analysis suggests a generally similar level of stroke-related knowledge between the two groups. This information provides valuable insights for refining stroke education strategies within college pharmacy curricula, emphasizing areas where knowledge gaps may persist among future pharmacy professionals.

Moving forward, proactive measures should be taken to integrate comprehensive education on HTN and stroke, addressing both non-modifiable and modifiable risk factors. These measures may include targeted modules, workshops, and practical training to equip future pharmacists with the knowledge and skills necessary to contribute effectively to stroke and HTN prevention and management.

Our study not only contributes to the existing body of knowledge on stroke and HTN but also advocates for a proactive approach to shaping the educational landscape for healthcare professionals. By empowering pharmacy students with a thorough understanding of these health dynamics, we pave the way for a future generation of healthcare providers who are better equipped to tackle the challenges posed by these prevalent and impactful medical conditions.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

BP: Blood pressure; **B.Pharm:** Bachelor of Pharmacy; **HTN:** Hypertension; **mmHg:** Millimeters of mercury; **Pharm.D:** Doctor of Pharmacy; **WHO:** World Health Organization.

SUMMARY

The research explores stroke and hypertension knowledge among pharmacy students. It highlights hypertension as a key risk factor for stroke, emphasizing the importance of regular blood pressure monitoring and management. The study, conducted at ASPM's K. T. Patil College of Pharmacy, Dharashiv, found significant differences in hypertension-related knowledge between B.Pharm and Pharm.D students, indicating the influence of education level on understanding. However, stroke-related knowledge showed no significant differences between the two groups. The findings emphasizes the need for tailored educational strategies to address knowledge gaps in hypertension and stroke, ensuring future pharmacists possess comprehensive knowledge. The study advocates for proactive measures in education to equip healthcare professionals with the skills needed for effective prevention and management of stroke and hypertension.

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