

Knowledge and Attitude of Pharmacy Students Regarding Timing of Prescribed Medicines Administration: Chronotherapy

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Abstract

Objective: This study aimed to assess the awareness and attitudes towards chronotherapy among final-year pharmacy students at Lahore Medical & Dental College, providing insights into their knowledge and receptiveness to chronotherapy principles. The introduction highlights the significance of considering the optimal time for drug administration in patient care, emphasizing the impact of biological rhythms on therapeutic outcomes.

Study type, settings & duration: This cross-sectional study was conducted at Lahore Medical & Dental College, Lahore, Pakistan from May to August 2021.

Methodology: The questionnaire, encompassing demographics, awareness, and attitudes towards chronotherapy, was administered to 110 participants, predominantly female (71.8%). The responses shed light on their knowledge of circadian rhythms and their openness to incorporating chronotherapy principles into practice.

Results: Findings unveiled a significant lack of awareness regarding evidence-based chronotherapy information among pharmacy students. Notable knowledge gaps surfaced, particularly in understanding optimal medication administration times, suggesting areas for educational enhancement.

Conclusion: Despite positive attitudes towards chronotherapy, the study concluded that there exists a considerable gap in awareness, underscoring the need for targeted educational interventions. Recommendations include the development of comprehensive chronotherapy-related educational programs to enhance pharmacy students' understanding and ultimately improve the quality of pharmacy services.

Key words: Chronotherapy, pharmacy students, awareness, attitudes, circadian rhythms, medication administration, educational programs.

Introduction

While prescribing medication to a patient, treating physicians and pharmacy professionals need to consider the "time" of administration. Patients also ask it especially when

a prescription handed over to the patient by his doctor and sometimes from the salesman or pharmacist at the pharmacy, while taking the counter medicines. Endogenous human biological circadian rhythms shown to continue in free-running situations.¹⁻³

The timing of medicine administration is crucial, particularly when managing and caring for patients.⁴ According to quite a lot of studies, taking drugs at specific times of the day may enhance their therapeutic effects.⁵⁻⁸ Since demonstrated that changes in biologic rhythms have an impact on both pharmacokinetics and pharmacodynamics, it is essential to consider changes into account before administering medication. Despite the numerous studies on circadian rhythms and chronotherapy, many medications are still given without taking into account the best time of day for their pharmacological effects. According to the World

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Authors Contribution

HM conceptualized the project. WI did the literature search. AM did the data collection. TZ & AN performed the statistical analysis. Drafting, revision & writing of manuscript were done by HM & FA.

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Health Organization's definition of rational medication use, patients must receive adequate prescriptions for the right drugs used for the right diagnoses at a reasonable cost.⁹

Maximizing therapeutic outcomes, promoting patient adherence, and encouraging quality pharmaceutical care are the ideal goals of rational medication usage. Pharmacists in collaboration with other healthcare professionals guarantee that this goal is accomplished use the W.H.O.-advocated principles of rational drug use. These principles suggest that when prescribing, it is crucial to provide patients with education on their medications and emphasize the importance of adhering to the prescribed dosage and schedule.¹⁰

Adjusting the time of delivery of medication according to the body's circadian rhythm, increase overall disease control and decrease adverse effects of the therapy. The aim of the present study is to evaluate the awareness and attitudes regarding chronotherapy among pharmacy students who will be pursuing careers in hospitals and pharmacies in the future. This study will identify if they have any knowledge of chronotherapy or not because otherwise, they will not be able to apply the chronotherapy concepts in practice, since a thorough comprehension of these principles could encourage the provision of high-quality pharmacological treatment.

Methodology

This cross sectional study was conducted at Pharmacy College at Lahore Medical & Dental College, Lahore, Pakistan from May to August 2021. Third and final year Pharmacy students were study population and a sample size of 110 participants was considered conveniently.

A self-administered, thoroughly researched, and organized questionnaire created, which was composed of 27 closed-ended questions and was divided into three sections: Section One; Demographics: It comprised four elements encompassing the gender, age, years of professional experience, and educational attainment of the participants. Awareness: It consisted of 12 items employing a Likert scale with two response options (Agree, Disagree) to assess comprehension of clinical case studies and awareness of circadian rhythms.

Eleven items were included, each offering five response choices on a Likert scale: Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree. These items aimed to assess participants' attitudes toward chronotherapy and their preparedness to apply chronotherapy principles in

their future professional endeavors. After in depth literature about the topic, a simple structured questionnaire was developed, which was distributed to all the 3rd year and final year students in pharmacy. The participation was voluntary. The data analysis was conducted using Statistical Package for Social Sciences (SPSS) version 20.0. Statistical significance was deemed at a threshold of $p \leq 0.05$.

The ethical approval was obtained from the Ethical Review Committee of Lahore Medical & Dental College Limited, Lahore vide letter no. LM&DC/4714.

Results

Total of 110 pharmacy students from the Pharmacy College of Lahore Medical and Dental College participated in the questionnaire, with no exclusions. In terms of gender distribution, the majority of participants were female (71.8%), while males constituted 28.2%.

As in Table-1, an overwhelming percentage of students (98.2%) acknowledged the impact of Circadian rhythm on human physiological processes, indicating a robust understanding of the concept. Only a minimal percentage (1.8%) disagreed with this perspective. Regarding the belief, that disturbance in the human body's circadian cycle could initiate disease processes, 25.5% of participants held this view.

In response to specific questions about cholesterol biosynthesis patterns and the optimal timing for administering statins with a longer half-life during the day, correct answers were provided by 58.2% and 39.1% of participants, respectively. When faced with a clinical case scenario regarding the optimal timing for the daily administration of perindopril to a non-dipping patient, only 57.3% of participants provided the correct answer.

In Table-2, which is the Attitude section of students, a significant proportion of participants (57.2%) agreed that chronotherapy could enhance a drug's efficacy, and 43.6% concurred that it could reduce adverse drug effects. The majority of respondents expressed agreement with statements (items 3, 4, and 5) regarding advising patients to take their prescriptions during a more productive circadian time frame. As in Table-3, notably a predominant percentage of participants (67.2%) advocated for the inclusion of chronotherapy in ongoing pharmacy education programs for professionals. Furthermore, 74.5% of respondents expressed a willingness to dedicate specific time for learning about chronotherapy.

Table 1: Students' reactions to awareness questions and the percentage of students providing accurate answers.

Physiological processes of humans are influenced by circadian rhythms.	98.2%
Disease conditions cannot be initiated by the disruptions of the circadian rhythms of the human body.	74.5%
Circadian rhythms encompass cycles in the physiological processes of numerous species, characterized by a period (cycle duration) of approximately 24 hours.	86.4%
For pharmacokinetics, circadian rhythms can affect the absorption of drugs.	71.8%
Cholesterol biosynthesis exhibits a pattern of peaking in the morning within a 24-hour time period.	41.8%
Statins with a longer half-life can be administered at any time of the day.	39.1%
Within a 24-hour time, period, gastrointestinal motility tends to decrease during the night.	85.5%
Symptoms of asthma are more likely to worsen during the night.	76.4%
NSAIDs (Non-steroidal anti-inflammatory drugs) are often prescribed for pain conditions like rheumatoid arthritis. The most suitable time to take this medication is in the evening.	50.0%
JA, a 25-year-old man diagnosed with peptic ulcers, has been prescribed Omeprazole 40mg daily. Omeprazole is more effective in increasing gastric pH when taken in the morning.	74.5%
Prednisone, a corticosteroid utilized for its anti-inflammatory and immunosuppressant effects in various conditions, including asthma attacks, is most appropriately administered in the morning during non-emergency situations.	63.6%
Perindopril, an angiotensin-converting enzyme inhibitor commonly used for treating hypertension, is best taken in the evening for non-dipper patients (those whose blood pressure does not decrease during sleep) when prescribed as a once-daily dose.	42.7%

Table 2: Pharmacy students' response to attitude questions.

	<i>Percentage of pharmacy students who responded with either 'Disagree' or 'Strongly disagree' to statements in the attitude section (%).</i>	<i>Percentage of pharmacy students who neither 'Agreed' nor 'Disagreed' with statements in the attitude section (%).</i>	<i>Percentage of pharmacy students who responded with either 'Agree' or 'Strongly agree' to statements in the attitude section (%).</i>
Chronotherapy has the potential to enhance the efficacy of a drug.	23 (22.7%)	22 (20%)	63 (57.2%)
Chronotherapy has the potential to decrease the occurrence of adverse drug effects.	28 (25.5%)	26 (23.6%)	56 (50.9%)
During the initiation of therapy, physicians or general practitioners should provide counseling to their patients regarding the more effective 'circadian-time windows' for drugs.	11 (10.0%)	26 (23.6%)	73 (66.3%)
Offering counseling to patients regarding the optimal 'circadian-time windows' for specific drugs, when applicable, could lead to improved adherence.	13 (11.8%)	24 (21.8%)	71 (64.5%)
When appropriate, recommending that patients take their medication during more effective 'circadian-time windows' for a specific drug may contribute to enhanced cost-effectiveness.	19 (17.3%)	24 (21.8%)	67 (60.9%)
Offering counseling to patients about chronotherapy has the potential to increase the number of patients returning to your pharmacy.	23 (11.8%)	38 (34.5%)	49 (44.5%)
Information on chrono-therapeutics should be in drug references.	15 (13.6%)	28 (25.5%)	67 (60.9%)

Table 3: Students' Future directions.

Continuing pharmacy education activities for pharmacy professionals should include coverage of chronotherapy as a relevant area of study	21 (19.1%)	22 (20.0%)	67 (60.9%)
As a pharmacist, I am open to dedicating time for learning about chronotherapy	09 (8.2%)	19 (17.3%)	82 (74.5%)
The principles of chronotherapy should be incorporated into the pharmacy course curriculum.	16 (14.5%)	20 (18.2%)	74 (67.2%)
Chrono-therapeutic studies should be incorporated into the regulatory requirements of therapeutic goods administration (DRAP) for the registration of a drug.	17 (15.5%)	20 (18.2%)	73 (66.3%)

Discussion

As of the search done, this is the first study in our region assessing pharmacy student's awareness and attitudes towards chronotherapy. Results supported our prediction that pharmacy students would lack the necessary understanding on chronotherapy. Even pharmacists in practice, when asked about the chronotherapy in a casual discussion were not aware of the term. Furthermore, our results showed remarkably favorable views towards chronotherapy and readiness to study and put chronotherapy's ideas into practice later in life. This finding positively suggests that any misunderstandings concerning chronotherapy could be cleared up if targeted educational initiatives are put in place to increase awareness of the treatment. Our research findings emphasize the lack of scientifically supported information on chronotherapy, particularly concerning the role of the circadian clock in normal physiological processes. These outcomes are consistent with a former study performed on comparable cohorts evaluating their views about and experience with the practical employing the chronotherapy tenets.⁵ This aligns with another study that investigated the knowledge and perspectives of final-year pharmacy students regarding chronotherapy,⁴ the results of both studies revealed that there was a paucity of knowledge regarding the most recent treatment research on chronotherapy.

The current study showed that only (42.7%) of the participating pharmacy student's provided accurate responses to evidence-based estimates of when Perindopril should be used.^{6,11} There is a possibility that physicians most commonly, in our area, use the FDA-approved ideal administration time i.e. Perindopril in the morning. It is implied that they might not be able to assist patients in receiving

benefits to the fullest from their prescription drugs by recommending optimum administration schedule for a health condition in which sleep abnormalities or disturbances in circadian BP cycles affect blood pressure control. As a result, new evidence-based therapeutic guidelines for the implementation of chronotherapies in clinical practice have been formulated and implemented and it is of prime importance, that details on the chronotherapy guiding principles should be updated and made accessible for pharmacy professionals, because doing so would increase their clinical expertise and assistance.

Interestingly, only (41.8%) of the participants know that the cholesterol biosynthesis follows a 24-hour cycle (circadian rhythm), as seen in a question in the section on awareness. Their response to that question was reflective, as only (39.1%) of the respondents provided the accurate answer 'any time of the day' for the use of statins with a longer half-life, as approved by the FDA.¹² This finding suggests that nearly fifty percent of the study participants either overlooked or have a poor understanding of fundamental concepts in physiology and pharmacology. The present finding aligns with a previous study, indicating that final-year pharmacy students exhibited poor performance in determining the "optimal administration time" for statins with longer half-lives.⁴ The outcomes of a study involving practicing community pharmacists in an eastern state of Nigeria, wherein the authors asserted that approximately 53% of the working community pharmacists infrequently attend refresher courses, workshops, and seminars, find support in this research.¹³ However, prevalence of similar condition in our region is not known evidently.

Statements related to counseling indicated that the majority of pharmacists accepted patients

and expressed readiness for the future application of chronotherapy in practice. This demonstrates their awareness of their responsibility to provide patient medication counseling, recognizing the shift in modern pharmacy practices from a product-oriented approach to patient-oriented pharmaceutical care. This conclusion aligns with the results of a study conducted in Nigeria, indicating that community pharmacists actively engage in patient education on health-related matters.¹⁴

This study showed that awareness about chronotherapy will be definitely impacted by younger age groups and years of practice. Pharmacy students and pharmacists with years of practice between one and ten years will have better significant awareness level. It may be because young pharmacists are leading the way in modernizing healthcare systems and because they have a greater availability of and easy access to the internet, an endless supply of information, than older pharmacists do. Additionally, rather than relying on simple facts, school curricula increasingly promote evidence-based information. Finally, the fact that awareness and attitude ratings in our study showed a positive association, suggests that proper awareness can result in a favorable attitude towards chronotherapy and, ultimately, excellent pharmaceutical practices.

Although majority of the pharmacy students' attitudes towards chronotherapy were overwhelmingly favorable, this study's findings show that both aspiring and working community pharmacists need access to thorough chronotherapy-related education, it is important to be aware of how the circadian cycle affects a drug's therapeutic effect, particularly if the patient is taking the medication for the first time.

Conflict of interest: None declared.

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