



Research article

PATIENT HABITS, MEDICINE CHARACTERISTICS, AND DEMOGRAPHIC CORRELATIONS IN ORAL MEDICATION ADMINISTRATION: A CROSS-SECTIONAL STUDY

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Abstract

Background

Commonly, medicine is taken orally, but consumers' habit and our body have a significant impact and actually heavy influence especially posture and vehicle with which administered. Oral table or capsule can get affected by uncomfortable position and inappropriate vehicle.

Objective

To study patient habits, medicine characteristics, and demographic correlations in oral medication administration.

Methods

A cross sectional study was performed using questionnaire in which using 663 participants who were at least of age ≥ 18 years old were participated. Along with medication characteristics and demographics, data collection included information on patient behaviours, such as body posture (standing, sitting, lying), kind of liquid used (water, milk, juice), volume of liquid administered, and ease of swallowing. The data was summarised using descriptive statistics and the relationships between swallowing ease and administration procedures were evaluated using chi-square tests.

Results

Our result showed that partisans' average volume size to administered medicine (108 mL) was smaller than advised in regulation. Nearly all participants (97.7%) preferred water for taking their medication. Participant who sat or stood up straight swallowed their tablet or capsule with ease, while 81.6 percent swallowed it entire i.e. no splitting and 58.4 percent did so without any problems. Statistical analysis ($P < 0.05$) confirmed that the good posture and adequate hydration are necessary for making tablets or capsules pleasant, easier to swallow and more comfortable.

Conclusion

Habits (body posture and liquid choice) are influence the efficiency and comfort of oral administration with a gap between volume recommended and real world practice, more interestingly vary from person to person. Providing education to improve administration techniques like posture and consuming enough fluid may ease swallowing and enhance overall therapeutic outcome.

Keywords: Habit, Medicine, Liquid intake; Medication behaviour

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1. Introduction

Theoral administration is the most common route of drug delivery, even a rate limiting step too. Tablet and capsules are being the most common dosage form due to its convenience and high rates of patient adherence. But, patient habitsinvolve a more decisionmaking process likesearching for, evaluating, and utilizing medical products to fulfilling their need. This process is deeply anchored in cognitive frameworks such as the Theory of Reasoned Action and the Theory of Planned Behaviour, which suggest that health-related actions are shaped by internal attitudes, subjective norms, and perceived habits.^[1-5] Although much and significant attention is often placed on prescribing and dispensing, the real-world habits or behaviour of how patients actually administer/take their medicine is aimportant but understudied determinant of therapeutic success.^[5-7]

Although, oral administration of medicine is preferred, some of the factors can significantly impact how the medicine reached gastrointestinal tract. the physical characteristic of medicine, size, shape, how patient swallow the medicine, habit of handling medicine like take as whole, crush, amount of liquid consume to administered medicine etc. can influence. While administering medicines orally is usually preferred, the overall effectiveness is heavily influenced by how patients consume them. Habits like swallowing them whole, crush them, or split changes its effect, also the type and volume of liquid used for swallowing: ranging from a few sips of water to larger amounts or even milk; play a significant role in ensuring the medication reaches the gastrointestinal tract safely and effectively. In addition to patient habits, physical characteristics of the medication, including size and shape, are important determinants of the ease of swallowing; data and practice at the time of routine suggest that patients experience a wide range of dimensions (length, width, height) and shapes (round, oblong, and oval), from very small to very large, and these physical characteristics may not be optimized for the patient, which may result in challenges with swallowing that prompt patients to change the dosage form, vehicle, or administration frequency.

Oesophageal transit is important and significantly influenced and dependent on body posture at the time of medication administration, with upright position promoting smoother transit and supine posture increasing the likelihood of oesophageal retention and irritation. Large-sized tablet(s) and capsule(s) that remain in the oesophagus can dissolve prematurely, which leads to localized injury, pain, ulceration, and significant swallowing difficulties. In addition, the type and volume of liquid (vehicle) at the time of swallowing have an effect on dissolution and bioavailability.^[5-19]

The choice and amount of the liquid vehicle at the time of swallowing are vital components of successful administration and inadequate liquid intake can significantly delays the transit and increase the risk of mucosal injury.^[5,16,17] In fact, to minimize these risks and ensure optimal drug delivery, performance, and absorption, regulatory bodies such as the U.S. FDA^[20] and the European Medicines Agency^[21] recommends that water volumes be 150 to 240 mL. Although water is the most common and safest vehicle, many patients use other beverages/liquids such as milk, juices, or soft drinks, which may interact with drug pharmacokinetics and alter systemic effects.^[5, 22-35] Additionally, patient behaviours such as swallowing techniques, perceived tablet or capsule size, and use of alternative liquids— affects adherence and outcomes. Approximately 8% of the population skips doses, and 4% discontinued therapy altogether due to such swallowing challenges.^[14, 15]

Given these complexities, attempt has been made to study patterns of oral medication administration among patients and to determine how demographic factors— specifically age, gender, education, and income— correlate with consumption methods, liquid intake, and the physical characteristics (size and shape) of tablets and capsules.

2. Materials and Methods

Study Design, Population & Sampling:

This was a cross-sectional study of a convenience sample of adults visiting community pharmacies for purchase of medicine in two community pharmacies of Gandhinagar city of Gujarat state, India who were invited to participate in study from October 2024 to February 2024. Gandhinagar has diverse population size of over 15 lakhs.^[36] Participants were provided an information about the study, process and their involvement and data collection. Consumers of aged ≥ 18 years; taking at least one medicine that are ingested orally, i.e., tablet or capsule; Those willing to sign a consent form were the inclusion criteria while exclusion criteria: Those with dysphagia and related signs and symptoms, severe GERD, mouth or throat ulcer, inflammation, or infection. Ethical approval was obtained from the Institutional Ethics Committee of KBIPER (Approval Ref: KBIEC/2024-25/PD5Y/07). The participants provided their written informed consent prior to the study.

Study Tools & Data Collection:

A structured, pre-validated questionnaire was used to collect data: demographic, body posture, liquid type and volume, and ease of swallowability. From literature and practice, 9 factors were selected that influence administration. For each factor, one question with appropriate options were assigned: medicine

consumption method, amount of preferred liquid, medicine form, shape and size, swallowability, body posture, etc., the questions were both open ended and close ended, participants were provided with trichotomous (three options) options and best possible options to answer. The questions were designed to gather the data about respondents' medicine administration practices, preferences, and impact of external factors on medicine administration. An overview of the factors, nature of questions and option used in the study is in **Table 1**.

Tablet and capsule sizes were measured using a vernier calliper (**Fig. 1**) directly on intact blister packs. Dimensions (length, width, thickness) were recorded by measuring the blister cavity and then subtracting the

thickness of the blister material. This provided approximate tablet/capsule sizes without damaging the packaging. As an alternative, blister cavity measurements were taken directly.

To study and explore the amount of fluids used for administration, participants were shown a standardized volumetric glass to aid accurate self-reporting of the amount used for administration. Furthermore, for assessing body posture participants were provided with **Fig. 2** which depicts the different body postures they are used to for taking medicines regularly. This approach minimized recall bias, reduced variability, and ensured reliable, quantifiable data for statistical analysis.

Table 1: Nature of Questions: Factor, Question and Option

Sr No.	Factor	Question stem	Option
1.	Medicine Taking Method	You take tablet(s)/capsule(s)as ____	Whole, Split, Crushed, As recommended
2.	Preferred Liquid	What type of liquid do you usually use to take tablets/capsules?	Water, Juice, Milk, Others
3.	Amount of Liquid	Amount of liquid you take with your tablets and/or capsules:___ (ml)	Numericentryin ml
4.	Medicine Form	What type of medicine do you take?	Tablets, Capsules
5.	Tablet/Capsule Size	What is the size of the tablet(s) /capsule(s) you are taking?	Very Small, Small, Medium, Large, Very Large
6.	Tablet/Capsule Shape	What is the shape of the tablet(s) /capsule(s) you are taking?	Round, Rectangle, Oval, Oblong, Other
7.	Ease of Swallowing	You find it ____to swallow tablet(s) or capsule(s).	Very Easy, Easy, Neutral, Difficult, Very Difficult
8.	Challenges in Swallowing	If you experience difficulty swallowing, please describe any challenges you face:_____	Choking, Coughing, Nausea, Fear, Discomfort, Reflux, Sticking Sensation, Others
9.	Body Posture	In which body posture you used to take tablet/capsule?	Standing, Sitting, Supine, Inclined, Lateral

Fig. 1: Vernier Callipers Scale

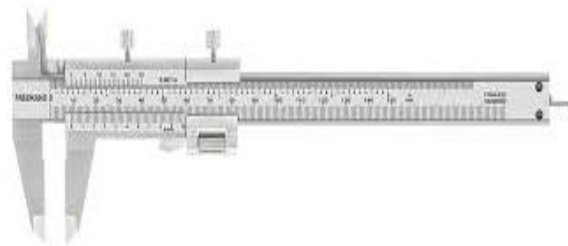
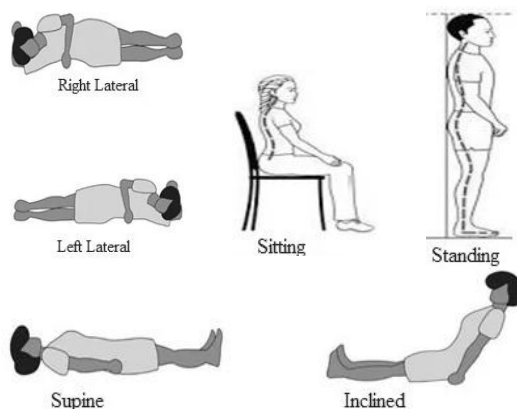


Fig. 2: Body Postures



Statistical Analysis:

Data collected were collated in the Microsoft Excel Version 21 and were analysed using SPSS version 20.0 with the help of statistician. To data is presented number, percentage, means, and standard deviations while statistical association was determined using Chi-square where appropriate at 95% confidence interval, p-value <0.05 significant. The STROBE cross sectional reporting guidelines were referred to report the finding of the study.^[37]

3. Results

Out of 682 participants, 19 participants' responses were incomplete or missing, and were not included in the data analysis, and hence which led the final sample size of 663 participants. The demographic profile showed that almost equal distribution between male (N=351, 53%) and female (N= 312, 47%). The mean age of the respondents was 48.3 (15.8 years) and the majority of the participants (n=144) were in the age group of 48 to

58 years. Educationally, 43% of the respondents were graduates. The majority of occupational category with 34%, was occupied by housewives, whereas people employed in jobs were 29% and businesses were 26%. Most of the study population belonged to the lower-middle and middle-income groups with, 74% of the study participants having their monthly income between 10,000₹ to 40,000₹, while 6.7% were earning less than ₹10,000 per month. Most of the participants (95%) preferred to purchase their medicines offline from pharmacy stores. The **Table 2** presents the demographic characteristics of the study participants (n=663).

Our findings show that the majority of participants practice safe habits when administering their oral medications. Most participants (81.6%) simply swallow their tablets or capsules whole, while another 13.1% are careful to follow their doctor's exact instructions. Water was by far the beverage of choice, preferred by an overwhelming 97.7% of respondents. Interestingly, most of them take their medication with

Table 2: Demographics of study participants

Demographic Variables	Frequency(%) (n=663)
Gender	
Male	353 (53)
Female	310 (47)
Age in year	
18-27	79 (11.91)
28-37	111 (16.74)
38-47	122 (18.40)
48-57	144 (21.71)
58-67	122 (18.40)
68-77	72 (10.85)
78-87	12 (1.80)
88-97	01 (0.15)
Education	
Illiterate	48 (7.24)
Primary	110 (16.59)
SSC (Secondary)	96 (14.47)
HSC (Higher Secondary)	90 (13.57)
Monthly Income in Rs	
Below10,000/-	45 (6.79)
10,000-20,000/-	223 (33.64)
20,000-40,000/-	245 (37.0)
40,000-50,000/-	91 (13.73)
Above 50,000/-	59 (8.9)

a moderate amount of liquid, usually between 50 and 149 ml. For example regarding the medicine itself, tablets were the most common dosage form (80.1%), with round (57.8%) and oblong (35.1%) shapes being the most prevalent. Participants often encountered both large and very small tablets and capsules. These patterns show that patients generally adhere to the fundamental: they don't change the dosage forms, and they reliably swallow with water.

The Majority of participants had no difficulty in taking their medications, with over 70% rating the experience as easy or very easy. Only about 5% reported difficulties, though their symptoms were uncomfortable, including throat irritation, coughing, nausea, and the sensation of a tablet(s) getting stuck in the chest. There was a nearly 50-50 split between sitting (46.6%) or standing (43.7%) as the preferred posture. Ultimately, the majority participants handles their medication well, the specific challenges faced by a small group, prove that educating patients on proper posture and swallowing techniques is still essential for comfort and safety.

To test whether demographic variable such as age, gender, education level, and income had a significant effect on how participants responded, we used Chi-Square test **Table 3** and **Table 4 show the specific correlations**. Age and education level are strong factors in how they actually take their medicine, but their choice of vehicle s correlated to age alone, with little impact by gender, income and education. This indicates that although different age groups have different preference and daily routine may influence these choice.

The data showed that both age and education level had a significantly impact on how much they actually take their medication. However, their choice of vehicle is primarily correlated with age alone, and largely not influenced by their gender, income, or education. This

suggest that although different age groups clearly have distinct preferences, it is probably cultural background and daily routine of the individuals that influence these decision as much as demographics alone. As we get older, swallowing becomes more difficult and older adults usually need to drink more to swallow their medicine comfortably, while younger adults tends to use less. Additionally, this highlights a clear genders difference in the amount of liquid they prefer to drink when taking their medicines.

The data revealed that whether a patient prefers a tablet or a capsule largely depends on their gender and income level. Meanwhile, preferences for specific characteristics of medicine are driven mostly by age, gender, and education, with income having no significant effect on what size or shape of tablet or capsule a person is comfortable swallowing.

While it seems like demographics would highlight how easily a patient swallows medication, especially since older adults generally face more physical hurdles. Yet statistically, age, education, and income do not have a significant influence on swallowing difficulties, gender shows only a minor effect on swallowing challenges. Instead, the findings show that mental hurdles, such as general anxiety have caused such significance.

Patient's age and education strongly influence their posture when taking medication. Older and more health-conscious individuals typically sit upright as recommended, while younger or less educated individuals may take medication more casually, these causes can potentially affect drug absorption and reduces its effectiveness.

As shown in **Graph 1**, shape of a medication definitely matters set the time of swallowing. Round tablets are widely considered the easiest to swallow, followed by oval tablets. While oblong tablets are perceived as more challenging, as respondents rated them as neutral or difficult. Though very few participants found any shape related difficulties.

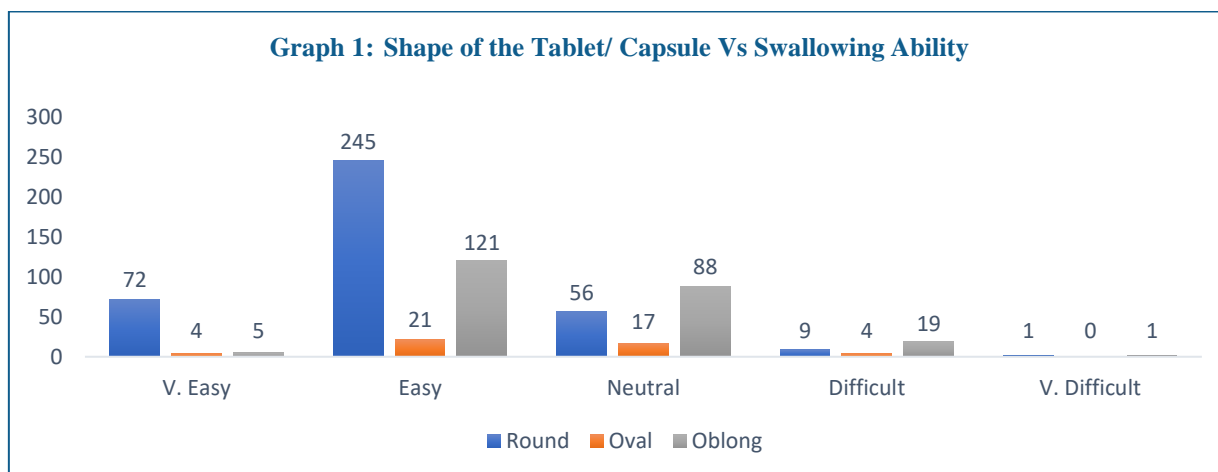


Table 3: Responses of Medicine Administration

Sr No.	Question and responses	Frequency N (%)	
1	You take tablet(s)/capsule(s) as _____?(n=663)	As recommended by doctor	87(13.1)
		Crush	3(0.5)
		Split it in half	2(0.3)
		Whole	541(81.6)
		Whole, As recommended by doctor	26(4)
		Split it in half, as recommended by doctor	1(0.1)
		Whole, crush	2(0.3)
		Whole, split it in half	1(0.1)
2	What type of liquid do you usually use to take tablets/capsules?(n=663)	Water	648(97.7)
		Milk	7(1.0)
		Water, Milk	6(0.9)
		Water, without water	1(0.1)
		No Liq. Taken	1(0.1)
3	Amount of liquid you take with your tablets or capsules: _____(ml)(n=663)	No liquid	2(0.3)
		One sip(10-25)	15(2.3)
		Few sips(25-50)	83(12.5)
		50-99	282(42.5)
		100-149	172(26)
		150-199	87(13.1)
		200-249	20(3.0)
250-300	3(0.4)		
4	What type of medicine do you take?(n=663)	Tablets	531(80.1)
		Capsules	60(9.0)
		Both	12(1.8)
5	What is the size of the tablet(s)/ capsule(s) you are taking?(n=663)	V. Small	180(27.1)
		Small	98(14.8)
		Medium	111(16.7)
		Large	216(32.6)
		V. Large	58(8.7)
6	What is the shape of the tablet(s) /capsule(s) you are taking?(n=663)	Oblong	233(35.1)
		Oval	46(6.9)
		Round	383(57.8)
7	You find it _____to swallow tablet(s) or capsule(s).(n=663)	Very Easy	81(12.2)
		Easy	387(58.4)
		Neutral	161(24.3)
		Difficult	32(4.8)
		Very Difficult	2(0.3)
8	If you experience difficulty swallowing, please describe any challenges you face: (n=34 responses collected, from n=663 respondents)	Chocking sensation	3 (0.5)
		Coughing sensation	2 (0.3)
		Discomfort in throat	12 (1.8)
		Feels like sticking in chest	2 (0.3)
		Nausea feeling	2 (0.3)
		Reflux	1 (0.1)
		Regurgitation	1 (0.1)
		Vomiting	1 (0.1)
		Chocking sensation, Coughing sensation	1 (0.1)
		Chocking sensation, Discomfort in throat	1 (0.1)
		Coughing sensation, Feels like sticking in chest	1 (0.1)
		Coughing sensation, Nausea felling	1 (0.1)
		Discomfort in throat, Feels like sticking in chest	1 (0.1)
		Fear of swallowing, Discomfort in throat	1 (0.1)
		Nausea feeling, Discomfort in throat	1 (0.1)
		Vomiting, Discomfort in throat	1 (0.1)
		Vomiting, Fear of swallowing, Discomfort in throat	1 (0.1)
Fear of swallowing, Reflux	1 (0.1)		
9	In which body posture you used to take tablet/capsule? (n=663)	Sitting position	309 (46.6)
		Standing position	290 (43.7)
		Sitting, Inclined	3 (0.5)
		Standing, Sitting	60 (9.0)
		Inclined Position	1 (0.1)

Table 4: Correlation between demographics and Medicine Administration

Stem	Variable	Age	Gender	Education	Income
Medicine Consumption Method	Pearson Chi-Sq.	77.956	5.804	30.434	10.715
	Sig.(2-sided)	0.000	0.122	0.010	0.553
	df	21	3	15	12
Preferred Liquid	Pearson Chi-Sq.	42.060	0.754	16.134	3.686
	Sig.(2-sided)	0.000	0.686	0.096	0.884
	df	14	2	10	8
Amount of Liquid	Pearson Chi-Sq.	71.969	1020.426	35.968	22.564
	Sig.(2-sided)	0.018	0.000	0.423	0.755
	df	49	14	35	28
Medicine Form	Pearson Chi-Sq.	22.842	226.357	2.776	15.962
	Sig.(2-sided)	0.063	0.000	0.596	0.003
	df	14	4	4	4
Tablet/Capsule Size	Pearson Chi-Sq.	46.650	349.813	340.083	7.326
	Sig.(2-sided)	0.015	0.000	0.000	0.966
	df	28	8	16	16
Tablet/Capsule Shape	Pearson Chi-Sq.	71.619	334.283	5.301	79.778
	Sig.(2-sided)	0.000	0.000	0.258	0.000
	df	4	4	4	4
Ease of Swallowing	Pearson Chi-Sq.	51.104	350.250	34.389	17.941
	Sig.(2-sided)	0.005	0.000	0.024	0.327
	df	28	8	20	16
Challenges in Swallowing	Pearson Chi-Sq.	19.678	26.972	15.522	8.209
	Sig.(2-sided)	1.000	0.042	1.000	1.000
	df	56	16	40	32
Body Posture	Pearson Chi-Sq.	185.434	1.414	100.708	13.008
	Sig.(2-sided)	0.000	0.493	0.000	0.112
	df	14	2	10	8

Table 5: Association Between the Amount of Liquid Intake and Tablet Size at the time of Medicine Administration

Amt. of liq. Taken (mL)	Size					Total
	V. Small	Small	Medium	Large	V. Large	
0-50	31	16	16	23	13	99
50-100	105	42	36	84	15	282
100-150	25	21	39	74	13	172
150-200	14	14	15	29	15	87
200-250	5	5	4	5	1	20

χ^2 : 61.10; P-value: 0.0000048; Df: 20; Interpretation: Highly Significant

Table 5 highlights a strong statistical significance between tablet size and amount of liquid a patient used to swallow medicine. The chi-square test result indicates that variations in liquid consumption are not independent of tablet size. This confirms that patients drink more liquid when taking large tablets and use less for smaller ones. Thus, this proves that people systematically adjust their fluid intake based on the size of the medication they need to swallow.

4. Discussion

The results confirm what earlier studies showing that upright posture is the safest way to take medication and poor postures significantly affects oesophageal drug transit and increase the risk of oesophageal injury. Significant proportion of participants reported swallowing difficulties, consistent with earlier findings by Stagemann et al. [16] and Hummler et al. [14], who demonstrated the impact of dosage form size and patient characteristics on swallowability. Water as a vehicle was reported by nearly all participants, aligning with Fuchs et al. [23], who showed that sufficient fluid is essential for oesophageal transit. Incorrect posture was identified as a significant contributor to swallowing difficulty, echoing the results of Channer et al. [7] and Osmanoglou et al. [6]. Most of the respondents took their medication as whole or as recommended by their doctor which align with the studies conducted by Hens et al. [39], that provide us with data regarding safety and efficacy for oral medicines where drugs are orally administered with a standard volume of water. However, in real-life, people will often make use of other drinks or other amounts of drinks to take their medication, mostly with a half glass of liquid or even just a sip to swallow the tablet and/or capsule. The impact of these “real-life” conditions on oral drug behaviour may contribute to inter-subject variability. [39] In the present study, nearly all respondents indicated to take their medication with water, and a small fraction opted milk (2%). Similarly, vehicle selection impacts drug bioavailability. Water remains the safest and most effective liquid due to minimal interaction with drug pharmacokinetics. Alternative beverages may alter drug absorption. A study from Gallo et al., reported a positive association of successful tablet/capsule deglutition with the volume of water being used. Even if 150 mL or 240 mL are recommended by EMA or the U.S. Food & Drug Agency, respectively. [20,21] However, on an average, when observed in real life setting participants used less than 150 mL of water, i.e. an average of 108 mL, to swallow the different tablets. Thus, participants used considerably less water for the deglutition than is generally recommended. In accordance with previous findings [15], we observed that tablet/capsule shape and size were related to the occurrence of swallowing difficulties. The influence of size seemed to be of major importance compared to the one of shape. These findings support the result of our study when observed in older participants. Most of the participants even consumed more amount of vehicle to administer even. Either too little or too more is associated needs corrections. As an explanation, insufficient amount of vehicle could be the reason form complaints while administering the medicine or as a consequence of an existing disease. Additionally, one more reason that they are unaware of the minimum administration requirement and associated behaviour. The findings of our study align with study by Osmanoglou et al. [6] the correlation analysis **Table 3** further revealed an important insight into how demographics: age, gender, education, and income

related to various aspect shows in also in study by Sarwinska et al. [35] who documented similar trends in older adults in Germany. Significantly demographics correlations further emphasized that age, gender, and education influence medicine administration behaviours, supporting previous evidence that physiological changes with aging, health literacy, and social support play critical roles in adherence. [40,41] Moreover, medicine characteristics: size, shape, and surface coating affected swallowability in healthy subjects. [41] These findings highlight how important it is for healthcare professionals to proactively screen for their swallowing practices, educate them on safe administration habits, and also consider alternative dosage forms when prescribing. A multidisciplinary, patient-centric approach that integrates clinical assessment, pharmaceutical formulation, and caregiver involvement is essential for minimizing risks and, improving adherence & optimizing therapeutic outcomes in common populus. Additionally, the findings emphasise the vital role of community pharmacists in patient counselling. Thus, by effective counselling on correct postures, swallowing techniques and the amount of liquid that person drinks when taking medicine, can minimise administration errors and improve adherence.

There are certain limitations of the study. The study included participants only from the Gandhinagar district, so the results cannot be generalized to other geographical areas. The study focused on only one medicine per patient at a time, even though patients may have been taking multiple medicines. The other types of formulations/medicine from system of medicine were not taken into consideration.

5. Conclusion

Our study highlights that patients' drug regimen are shaped by their demographics and the physical characteristics of the medication they take. A significant proportion of the participants consumes medications with insufficient liquid, deviating from the 150–240 mL standard recommended by regulatory agencies. In Addition, the physical characteristics of tablets and capsules, i.e., shape and size, have significant influence on ease of swallowing, which is clearly different for different age and gender groups. Because there is the strong statistical correlation observed between demographics (age, gender, and education) and administration behaviour. Healthcare providers must offer individualised advice and counselling to ensure therapeutic success and avoid any injuries, along with administration techniques, stressing importance of proper posture and sufficient water intake. Therefore, the role of information and advice on medicine by pharmacist is vital need in bridging the gap between poor daily habits and optimizing drug efficacy, which improves the subsequent therapeutic outcome.

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8. Conflicts of Interest

The authors declare no conflicts of interest.

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