PREFERENCES OF COLOR, SIZE, SHAPE, AND TASTE OF ORAL SOLID DOSAGE FORMS

Inas Rifaat Ibrahim*, Mohamed Izham M.I. and Mahmoud Al-Haddad

Discipline of Social and Administrative Pharmacy, School of Pharmaceutical Sciences, Universiti Sains Malaysia, 11800, Penang (Malaysia)

Summary

The purposes of this study were to investigate the most preferred oral solid dosage forms (OSDF) and the form that seems easy to swallow; preferences of color, shape, size, and taste of OSDF; and to determine possible associates with public preferences. Self-administered questionnaires were distributed among 350 individuals in Penang Island. Samples of different OSDF (capsule, tablet, caplet, and soft gel capsule) were shown to the respondents during the interview. Data were presented by frequencies and percentages for categorical variables and were analyzed by using Chi- square test at an alpha level of 0.05. Results revealed that capsule was the most preferred OSDF while soft gel seemed to be the easiest form in swallowing. Most respondents preferred OSDF to be white in color, round in shape, small in size, and without taste. A significant difference ($p<0.05$) was found between gender and ethnic groups toward the preferred OSDF. The most important physical characteristics of OSDF were size followed by taste, shape, and color respectively.

Key words: Color; Easy to swallow; Oral solid dosage form; Preference

* Corresponding author: Phone: +60193611307; E-mail: phm.enas@yahoo.com.

Introduction

Due to their convenient use, oral solid dosage forms (OSDF) are more popular preparations nowadays (1). Their visual appearance and ease of swallowing have an effect on public preferences and acceptance of this type of pharmaceutical preparations (2). It has been agreed that the formulation of medicine, color, size, shape, and taste are related to the credibility of the treatment (3, 4). Thus, the importance of visual characteristics of OSDF has been investigated. Few reports addressed public preferences and expectations toward the appearance of OSDF have been found. Soft gel was preferred over other forms and was found to be easier in swallowing than coated tablet and tablet; white was the preferred color; the preferred shape was strongly arched circular (2, 5). Researchers stressed the importance of pill color that has been associated with specific expectancies. Red OSDF considered as strong and active while blue and green as depressants (6). Moreover, it was found that red and orange capsules were ranked as strongest while white capsules were rated as weakest (7).

Size and shape of OSDF also have been addressed recently. Koteles and Bardos reported that large oblong tablet was preferred over small and medium round tablet (8). While, Buckalew and Coffield found that capsule size is associated with the strength of medicine, a conclusion of "bigger is better" was reached (3).

Another challenging factor for many people to complain and continue their prescribed oral medication is the taste. For good compliance; taste, size, and type of formulation of oral preparations should be accepted and preferred (9).

No published data available in Malaysia regarding public preferences and expectations of OSDF. For this reason the current study was conducted to investigate the preferred OSDF and the form that seems easy in swallowing; to determine public preferences toward the physical characteristics of OSDF like color, shape, size, and taste; to determine the possible factors that might be associated with these preferences like gender and ethnic groups.

Methods

Study Design

A cross-sectional descriptive study was conducted in Penang Island, northern state of Malaysia. A structured and self administered questionnaire was developed and validated at the discipline of Social and Administrative Pharmacy (DSAP) and used for data collection. A total of 350 questionnaires were distributed conviently among public in three shopping malls in the city. The protocol of the study was reviewed and approved by the Universiti Sains Malaysia. Individuals of both genders, above 18 years old and able to read and write the questionnaire were invited by a written consent to participate in the study. Children were excluded from this study.

Study Tool: The questionnaire

The questionnaire consisted of four sections. The first section gathered information regarding demographic data like gender, age, and ethnic group. The second section comprised a set of questions regarding preferences of the following OSDF capsule, tablet, caplet, and soft gelatin. The third section of the questionnaire contained questions to determine the form that seems easy in swallowing on four-point scale (very easy to swallow, easy to swallow, difficult to swallow, and very difficult to swallow). The last section consisted of a list of questions regarding preference of color, shape, size, and taste of OSDF. At the end of this section, respondents were asked to rank these physical characteristics in terms of their importance to the public themselves.

Statistical Analysis

The valid data were coded, entered, and analyzed using the Statistical Package for Social Science (SPSS) version 16. Descriptive results were presented as frequencies and percentages. Chi-square test was used to compare the frequencies of cases found in the variables. Statistical significance was set at $P < 0.05$.

Results

Characteristics of Respondents

A total of 300 questionnaires out of 350 were completed successfully and returned with a response rate 87.5%. Most of the respondents were females (n= 180; 60.0%). The mean age of respondents was 37.2$\pm$ 14.4 years, with a range of 19-89 years. All demographic characteristics are presented in Table 1.

Table 1.Demographic characteristics of respondents

Characteristics		n (%) {N= 300}
Gender	Male	120 (40.0%)
	Female	180 (60.0%)
Age in years	19-39	213 (71.0%)
	40-59	70 (23.3%)
	60+	17 (5.7%)
Ethnic group	Malay	123 (42.1 %)
	Chinese	151 (50.3%)
	Indian	16 (5.3%)
	Other	10 (3.3%)

Preferences of OSDF and the Ease of Swallowing

Overall, Capsule was the most preferable OSDF by the majority of respondents (37.3%; n=112). A significant difference was found between gender preferences in which females tend to prefer capsule more than males (P= 0.018). Similarly, ethnicity found to significantly affecting on respondents preferences of OSDF (P= 0.023). Capsule was preferred by both Chinese and Malays while tablet and soft gel was the preferred form by Indians and other races as shown in Table 2.

Table 2. Gender and ethnic group preferences of OSDF

Variables		Preferred form n (%) {N= 1000}				P- value
		Capsule	Tablet	Caplet	Soft gel	
Gender	Male	45 (15.0%)	38 (12.75)	5 (1.7%)	32 (10.7%)	0.018*
	Female	67 (22.3%)	39 (13.0%)	11 (3.7%)	63 (21.0%)	
Ethnic groups	Malay	53 (17.7%)	32 (10.7%)	2 (0.7%)	36 (12.0%)	0.023*
	Chinese	57 (19.0%)	35 (11.7%)	11 (3.7%)	48 (1.0%)	
	Indian	1 (0.3%)	7 (2.3%)	1 (0.3%)	7 (2.3%)	
	Other	1 (0.3%)	3 (1.0%)	2 (0.7%)	4 (1.3%)	

* A significant difference was detected by Chi- square test (P <0.05)

Regarding the form that seems easy in swallowing, soft gelatin was rated by 43.7% (n=131) of respondents as the form that seems very easy to swallow followed by capsule (39.3%; n=118), tablet (25.7%; n=77), and caplet (10.3%; n=31) as shown in Table 3.

Table 3.OSDF that seems easy to swallow

Dosage form	Responses n (%) {N= 300}				P- value
	VE	E	D	VD	
Capsule	118 (39.3%)	116 (38.7%)	39 (13.0%)	27 (9.0%)	0.018*
Tablet	77 (25.7%)	41 (31.7%)	90 (30.0%)	92 (30.6%)	
Caplet	31 (10.3%)	53 (17.7%)	101 (33.7%)	115 (38.3%)	
Soft gel	131 (43.7%)	72 (24.0%)	51 (17.0%)	46 (15.3%)	

Abbreviations: V, very east to swallow; E, east to swallow; D, difficult to swallow VD, very difficult to swallow

*A significant difference was detected by Chi-square test ($p< 0.05$)

Preferences of the physical characteristics

All of the respondents reported their preferences toward color, shape, size, and taste of OSDF as shown in Table 4. White was the preferred color of OSDF by more than half of the respondents (55.3%; n= 166); followed by blue (19.7%; n= 59); pink (14.6%; n=44); orange (9.6%; n= 29); yellow (9.0%; n= 27); and finally purple (7.0%; n= 21). For the shape, slightly more than half (53.4%; n=160) of the respondents preferred round shape OSDF. Other shapes preferred were oval (41.6%; n= 125), and Triangle (3.7%; n= 11). Moving to the size, the majority of respondents (67%; n=201) preferred their oral solid medication to be small in size; however, (31.3%; n= 94) of the respondents preferred medium size and (1.7%; n= 5) preferred big size OSDF.

For the taste, more than half (55.0%; n= 165) of respondents preferred their OSDF to be without taste while (40.7%; n= 122) preferred sweet taste. Only (4.3%; n= 13) preferred bitter taste. Interestingly, preferences of the physical characteristics were varied by gender in which Chi- square test detect a significant level ($P<0.05$) between genders and their preferences of color, shape, size but it was not the case with preferences of taste.

Table 4. Gender preferences of the physical characteristics of OSDF

Characteristics of OSDF		Gender {N= 300}		*P*- value
		Male	Female	
Color	White	69 (23.0%)	97 (32.3%)	0.03 *
	Blue	33 (11.0%)	26 (8.7%)	
	Pink	10 (3.3%)	34 (11.3%)	
	Orange	19 (6.3%)	10 (3.3%)	
	Yellow	7 (2.3%)	20 (6.7%)	
	Purple	9 (3.0%)	12 (4.0%)	
Shape	Round	72 (43.0%)	92 (56.1%)	0.019 *
	Oval	40 (13.3%)	85 (28.3%)	
	Triangle	8 (2.7%)	3 (1.0%)	
Size	Small	67 (22.3%)	134 (44.7%)	< 0.001 *
	Medium	48 (16.0%)	46 (15.3%)	
	Big	5 (1.7%)	-	
Taste	Without taste	62 (20.7%)	103 (34.3%)	0.344
	Sweet	54 (18.0%)	68 (22.7%)	
	Bitter	4 (1.3%)	9 (3.0%)	

* A significant difference was detected by Chi- square test ($p < 0.05$)

With respect to the importance of the physical characteristics, slightly more than half (52.3%; n= 157) of the respondents rated the size as the most important characteristic followed by taste (40.7%; n=122), shape (13.6%; n=41), and color (13.4%; n=40) respectively as shown in Table 5.

Table 5.The importance of physical characteristics

Dosage form	Responses n (%) {N= 300}			
	MI	I	NI	LI
Color	40 (13.3%)	25 (8.3%)	71 (23.7%)	164 (54.7%)
Shape	41 (13.6%)	72 (24.0%)	108 (36.0%)	79 (26.3%)
Size	157 (52.3%)	105 (35.0%)	32 (10.7%)	6(2.0%)
Taste	122 (40.7%)	78 (26.0%)	69 (23.0%)	31 (10.3%)

Abbreviations: MI, most important; I, important; NI, not important; LI, least important

Discussion

Although public preferences and product acceptance have been the subjects of much marketing research but little attention was targeted on the pharmaceutical formulations and their physical characteristics. Expectations toward these physical characteristics play an important role in the medication adherence and successful therapy outcome and might be the first important factor in the choice of medicine (10). Our findings are the first in Malaysia, and one of the very few available all over the world (4).

Over all preferences, capsule was the most preferred form versus other OSDF. Previous results in literatures also reported the superiority of capsule among other formulations (2, 11). This could be due to the fact that capsule is easy to swallow and perceived to be more powerful than other dosage forms (3, 11). Further explanation can be added in which the majority of ethnic groups in this study were Malay and Chinese and their preferences might be related to their frequent exposure to the traditional medicines, which are available in capsule form. Gender and Ethnic groups' differences in the preferred OSDF were demonstrated. Gender differences in preference of the physical characteristics of medicines and culture learning mechanism were discussed previously (12).

A significant difference was found with respect to the public expectations toward the form that seems easy in swallowing. It was found previously that soft gel is the form that perceived to be easy in swallowing (5, 10).

It appeared that a preference toward the physical characteristic of OSDF is the field in which literatures are scarce. Our study revealed an interesting results in which genders have their different preferences toward a particular characteristic of OSDF except with the taste. Females tend to prefer pink color OSDF while males tend to prefer blue. In cultures, pink represents girlishness and femininity while blue is neutral and associated with clear thinking (13). Round shape and medium size were the most preferred characteristics in OSDF for both genders. A possible explanation can be driven by the easily passage of the small size and round shape OSDF through the esophagus (2, 14). Size of OSDF was rated as the first important characteristics followed by taste, shape, and color. Nearly, similar results were found by Brotherman et al. in which size was rated as the most important characteristics followed by shape, taste, and finally color (10).

Findings from this study suggest that the formulation of medicines and their physical characteristics are of high importance in encouraging patients to continue using a particular medicine. Further, they are important factors in influencing initial selection of products available in the market especially with non-prescribed medications.

Conclusion

Public have their preferences toward a particular OSDF in which capsule is the preferred one in Penang Island while soft gelatin is the form that seems the easiest to swallow. Size of OSDF is the most important physical characteristic for public to manage their choices, followed by taste, shape, and color. There are significant differences in terms of gender and ethnic group toward the preferred OSDF. Findings from this study can help the pharmaceutical firms to better understand their consumers in providing friendly products, which indirectly enhance treatment compliance. Prescribers may consider public expectations and ease of swallowing oral solid medications in continuation of the treatment and adherence programs.

Acknowledgments

We would like to thank all the participants in this study for their time to review the questionnaire and document their responses.

References

1. Zaid A, Abu Ghosh A, Sweileh W, Al-Jabi S, Jaradat N. Chewable tablets: is this dosage form well evaluated by Palestinian health professionals?. The Islamic University Journal 2007; 5:83-94.
2. Overgaard A, Hojsted J, Hansen R, Moller-Sonnergaard J, Christrup L. Patients' evaluation of shape, size and color of solid dosage forms. Pharmacy World & Science 2001; 23:185-188.
3. Buckalew LW, Coffield KE. An investigation of drug expectancy as a function of capsule color, size and preparation Form. J Clin Psychopharmacology 1982; 2:245-8.
4. Koteles F, Fodor D, Cziboly A, Bardos G. Expectations of drug effects based on color and sizes- the importance of learning. CEMED 2009; 3:99-107.
5. Jones WJ, Francis JJ. Soft gels: Consumer perceptions and market impact relative to other oral dosage forms. Advances in Therapy 2000; 17:213-221.
6. de Craen M, Roos J, Vries L, Kleijnen J. Effect of color of drugs: systematic review of perceived effect of drug and of their effectiveness, BMJ 1996; 313:1569-1570.
7. Buckalew LW, Sallis RE. Patient compliance and medication perception. Journal of Clinical Psychology 1986; 42:49-53.
8. Koteles F, Bardos Y. Expectations of drug effects based on colors and sizes of tablets. Mentalhigiene es Pszichoszomatika 2007; 8: 277–290.
9. Reginster J, Kaufman J, Gangjii V. Preference for and acceptability of two formulations of a dietary supplement containing calcium plus vitamin D3: a Randomized, open-Label, crossover trial in adult patients with calcium and vitamin D deficiencies. Current Therapeutic Research 2005; 66:23-34.
10. Brotherman DP, Bayraktaroglu TO, Garofalo RJ. Comparison of ease of swallowing of sietary Supplement products for age-related eye disease. Journal of the American Pharmacist Association 2004; 44:587-593.
11. Bhosle M, Benner J, DeKoven M, Shelton J. Difficult to Swallow: Patient preferences for alternative valproate Pharmaceutical formulations. Patient Preferences and Adherence 2009; 3:161-171.
12. Buckalew LW, Coffield KE. Drug expectations associated with perceptual characteristics: ethnic factors. Percept. Motor Skills 1982; 55:915-918.
13. Wilknison EJ, Sherk HA. The use of visualiInformation for planning accurate steps in a cluttered environment", Behav. Brain Res 2005; 20:270-274.
14. Channer K, Virjee J. The effect of size and shape of tablet on their esophageal tract Transit. J Clin Pharmacol 1986; 26:6-141