Archives of Pharmacy Practice

Research Article

ISSN 2045-080X

Vol. 1, Issue 1, 2010

Consumer Preferences and Perceptions towards the use Colored Oral Solid Dosage Forms in Baghdad

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Citation : Inas R I[*], Izham M.I & Mahmoud A H. **Consumer Preferences and Perceptions towards the use Colored Oral Solid Dosage Forms in Baghdad.** Archives of Pharmacy Practice. 2010;1(1)pp 15-19.

Abstract

Objective: The main aims of this study were to determine consumers' preferences and perceptions in Baghdad towards the color of Oral Solid Dosage Form.

Materials and Methods: A cross sectional study was conducted using a self–administered questionnaire. A convenient sampling method was adopted to approach the consumers visiting the community pharmacies in Baghdad. The data collected was analyzed using SPSS version 16 ®. A non-parametric statistics i.e [Chi-square, Mann-Whitney and Kruskal-Wallis tests] were used to evaluate the association of demographic variables with respondents perceptions toward physical characteristics of Oral Solid Dosage Form.

Results: Colored OSDF was preferred by 76.4% of consumers. Significant differences in this preference were found among genders (P=0.029); age (P<0.001); educational level (P=0.001); and monthly income level (0.007). Further, consumers perceived that color of OSDF is related with the therapeutic activity of medicine. Significant differences in this perception were found to be influenced by gender (P=0.016); age group (P<0.001); and educational level (P<0.001).

Conclusion: In a conclusion, color was the most preferred characteristic of OSDF by Baghdadi consumers with the perceptions that color is related to therapeutic activity of medicines. Gender, age, educational level, and monthly income are important factors that are associated with the preferences and perceptions toward colored OSDF.

Keywords:

Color, oral solid dosage forms, perceptions, preferences

Manuscript History:

Article Received on: 20th Sept, 2010
Revised on: 13th Oct, 2010
Approved for Publication: 15th Oct, 2010

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Conflict of interest:

All the authors have no conflict of interest

Introduction:

Color is widely used for aesthetics, coding and practical purposes in the manufacturing of medicine [1]. Researches on the effect of color on human response had been extensively investigated in the field of psychology and product marketing; but little was offered to understand consumers' preferences and perceptions toward colored pharmaceutical preparations especially Oral Solid Dosage Forms (OSDF). These formulations considered as highly prescribed and dispensed formulations nowadays [2]. Few evidences were found which stressed the importance of color on consumers' mind and acceptance of the prescribed treatment which formulated as OSDF. One study recommended the use of white color OSDF due to a preference effect [3]. However colored OSDF was preferred in other study for differentiation purpose [4]. Further, it was found that various colors of OSDF may be understood to be related with some pharmacological properties like speed of action, effectiveness, or site of action inside the body [5, 6]. White and green perceived to be related with analgesic effect, orange and yellow related with stimulant effect, and blue to aid in sleep [1, 7]. Although there is no underlying theory of consumers' preferences and responses to the color of products yet; researchers referred these preferences as a result of associative learning mechanism. This mechanism occurs through connections of the events and the surrounding environment [8]. Within this context, it can be assumed that the color of OSDF constitute an important stimuli for consumers to respond to the treatment. These stimuli may play a crucial role in compliance and continuation with the prescribed treatment [5, 9]. If the color of medicine was not in accordance with the perceived effect, consumers may not respond to their treatment [1, 10]. This study was conducted to determine (1) consumers' preferences toward colored OSDF; (2) perceptions toward therapeutic benefit of medicine in a relation with the color of OSDF; and (3) factors that might be associated with these preferences and perceptions.

Materials and Methods:

A cross-sectional design using a pre-piloted questionnaire was conducted among consumers in Baghdad; the capital of Iraq, between December 2009 and May 2010. Consumers were conveniently recruited from community pharmacies with regard to the geographical areas of the city; North, South, West, East, and Centre. The most important reasons to follow this

setting were; the serious and critical situation of Baghdad include suddenly occurred explosions and abduction of scientific personnel, the presence of road blocks and concrete walls surrounding the residential areas, difficulties of freedom movement of the researchers due to the presence of check points and U.S. military convoys. In the community pharmacies a letter explaining the aim of the study was given to pharmacists in-charged and written consents were introduced to consumers for participation in the study. Sampling frame was defined as any consumer visiting community pharmacy in Baghdad to purchase medicine; above age 18; and not too ill to complete the questionnaire. Children were excluded from the study.

Study tool: the questionnaire:

The pre-piloted and validated questionnaire encompassed three main sections. The first section about preferences of colored OSDF (consumers viewed samples of colored and non colored OSDF like capsule, tablet, and coated tablet on a black pad and identified the preferred characteristics toward color). Also, this section contained questions regarding the most preferred colors and responses if the pharmaceutical industry remanufactured the color of medication to another color. The second section contained questions to assess perception toward color of OSDF in a relation with the therapeutic benefit of medicine which is determined in terms of effective, fast acting, useful for serious diseases, safe, and high in quality using four-point Likert scale (strongly agree, agree, disagree, and strongly disagree). For "strongly agree" was given a score of 1, for "agree" was given a score of 2, for "disagree" was given a score of 3, and for "strongly disagree" was given a score of 4. The maximum score reflects positive perception. This scaling method had been adopted from previous literature based on Daher and Amin criterion to assess consumers' perceptions [11]. This established criterion considered the value of more than 70% of the total domain score to represent positive perception; however each value of the total domain score below that reflects negative perception. As a result, a total score of more than 14 indicated positive perceptions in this study. The last section contained questions regarding demographic information such as gender, age, educational level, and monthly income. For ease of analysis, consumers were divided into three age groups 18-29, 30-44, 45+. Educational level was assessed by asking the patient to report whether they had gained qualification at primary level (primary or secondary school); average level (high school or institute); and high level (college or postgraduate).

Statistical analysis:

The data were entered and analyzed using the Statistical Package for Social Science (SPSS) version 16. Descriptive results were presented as frequencies, percentages, mean± SD, and median. Chi-square statistical analysis was used for significant associations between each variables and preferences toward color of OSDF. Mann-Whitney and Kruskal-Wallis tests were used to find associates with perceptions toward color of OSDF. A significant level was accepted at $p<0.05$.

Results:

A total of 1000 out of 1200 questionnaires were completed giving a response rate of 83.3%. The mean age of consumers was 39.33± 12.97 years, with a range of 18-72 years. More than half of consumers were males (56.6%; n=566). The largest proportion (39.2%; n=392) were aged 30-44 years, followed by 45+ years age group (31.0%; n=310), and the 18-29 years age group (29.8%; n=298). Full consumers' characteristics are listed in Table 1.

Table 1: Characteristics of the consumers [N= 1000]

Characteristics		n (%) {N= 1000}
Gender	Male	566 (56.6%)
	Female	434 (43.4%)
Age groups in years	(18-29)	298 (29.8%)
	(30-44)	392 (39.2%)
	(45+)	310 (31.0%)
Educational level [a]	Low	271 (27.1%)
	Average	400 (40.0%)
	High	329 (32.9%)
Monthly income level [b]	Low	270 (27.0%)
	Average	560 (56.0%)
	High	170 (17.0%)

a. Educational levels were categorized by low (Primary & Secondary school), Average (High school & Institute), and High (College &Postgraduate)

b. Monthly income levels in Iraqi Dinar (ID), (each 1$= 1.25 ID), were categorized by Low (≤ 100000 to 300000 ID); Average (300001 to 1000000 ID); High (1000001 to ≥ 3000001 ID)

Generally, more than three quarter of consumers (76.4%; n=764) preferred the colored OSDF, while few of them (12.8%; n=128) did not matter the color of OSDF, and only 10.8% (n=108) did not prefer the colored OSDF as shown in Figure 1. Consumers who preferred the colored OSDF assigned the colors they prefer most on the open ended section of the questionnaire. The preferred colors were green, blue, orange, red, pink, and brown color. Also, some reasons were pointed out behind this preference and they were; for differentiation purposes, makes me fell relax, I like this color, clear color, color of the sky, color of trees, color of most effective medicine, good for Insomnia, and vital color. Moreover, consumers documented their responses if the pharmaceutical industries remanufactured the color of the medication they are accustomed to it to another color.

Figure 1: Preferences toward colored oral solid dosage forms

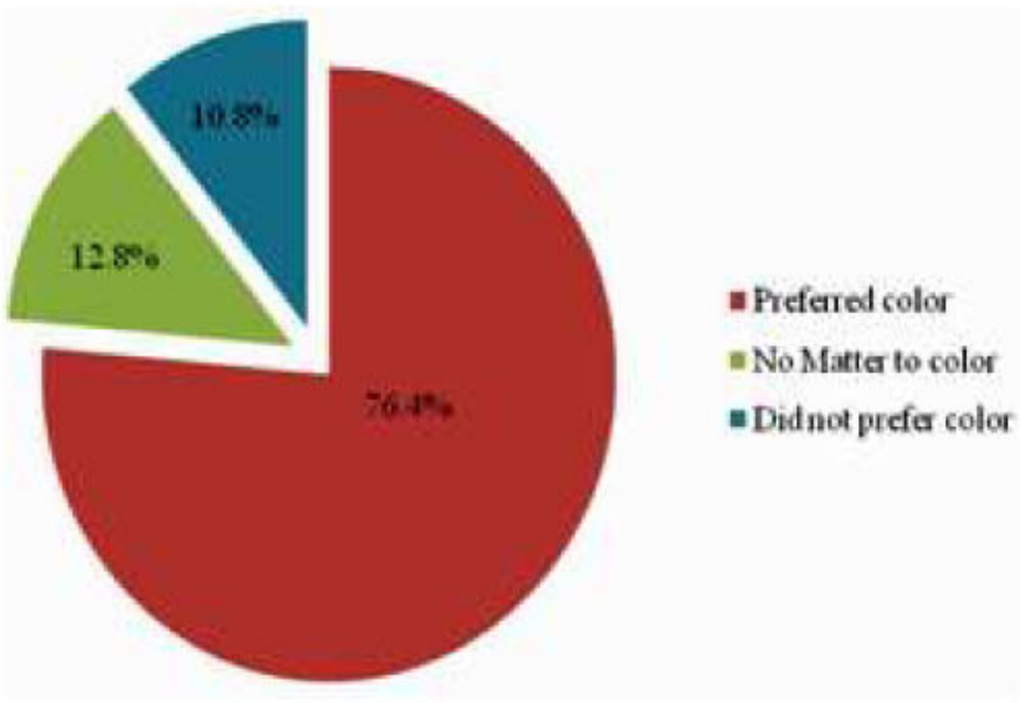
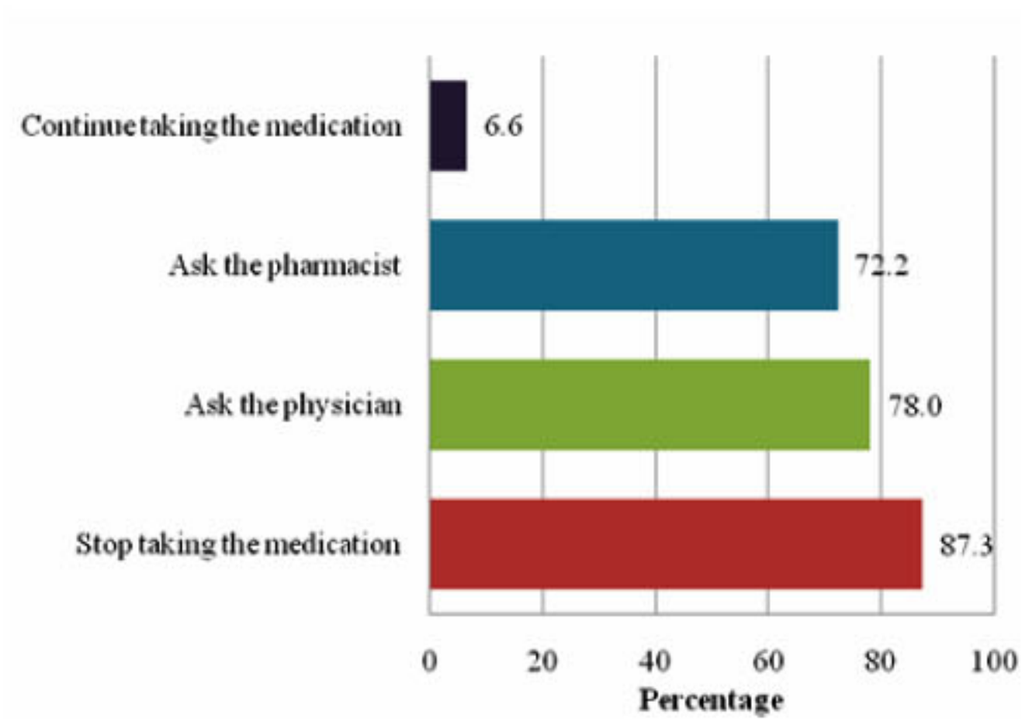


Figure 2: Responses toward changing the colored of medications



As shown in Figure 2; most of consumers (87.3%; n= 873) will stop taking the medication, more than three quarter (78.0%; n= 780) will ask the physician, less than three quarter (72.2%; n= 722) will ask the pharmacist, and only few of them (6.6%; n= 66) will continue taking the medication. Although colored OSDF was the most preferred characteristic; appreciable variability was found according to the socio-demographic characteristics of the consumers as shown in Table 2. Both males (79.4%. n= 449/ 566) and females (72.5%; n=315/434) preferred colored OSDF over non colored one (8.8%; n= 50/566) and (13.4%; n= 58/434). There is a tendency of males to prefer colored medications more than females. Statistically, Chi-square test detected a significant association in these preferences (P=0.029). Regarding consumers' age, all the categorized age groups preferred color OSDF versus non colored one. However, both 39-44 years age (72.4%; 284/392) and 45+ years age (87.7%; n= 272/310) groups seemed to prefer colored medications more than 18-29 age group (69.8%, n= 208/298). A significant difference was found in preferring colored OSDF over other discussed color

Table 2: Factors that influenced preferences of colored OSDF {N=1000}

Characteristics		Preferences n (%)			P
		Colored	Not colored	It does not matter	
Gender	Male	449 (79.4%)	50 (8.8%)	67 (11.8%)	0.029*
	Female	315 (72.5%)	58 (13.4%)	61 (14.1%)	
Age groups	(18-29)	208 (69.8%)	44 (14.8%)	46 (15.4%)	0.000*
	(30-44)	284 (72.4%)	59 (15.1%)	49 (12.5%)	
	(45+)	272 (87.7%)	5 (1.6%)	33 (10.6%)	
Educational level [a]	Low	192 (70.8%)	42 (15.5%)	37 (13.7%)	0.001*
	Average	313 (78.3%)	46 (11.5%)	41 (10.3%)	
	High	259 (78.7%)	20 (6.1%)	50 (15.2%)	
Monthly income level in ID [b]	Low	187 (76.6%)	36 (14.8%)	21 (8.6%)	0.007*
	Average	445 (75.9%)	63 (10.8%)	78 (13.3%)	
	High	132 (77.6%)	9 (5.3%)	29 (17.1%)	

[a] Educational levels: low (Primary- Secondary school), Average (High school- Institute), and High (College- Postgraduate).

[b] Monthly income levels: Low= (≤ 100000) and (100001- 300000), Average= (300001-600000) and(600001- 1000000), High= (1000001-300000) and (≥ 3000001).

* Chi-square test P <0.05

characteristics (P<0.001). For the educational level, all the three educational level groups preferred colored OSDF. Chi- square test detected a significant associations in preferences of colored OSDF (P=0.001). Both average (78.3%; n= 313/586) and high (78.7%; n= 259/170) educational levels preferred the colored medications more than the low educational level group (70.8%; n= 192/244). For the income levels, the three categorized groups preferred colored OSDF over other color characteristics, also a significant level was reached by Chi-square test (P<0.001).

Consumers also responded to the perception items and coded their level of agreement and disagreement on Likert scale choices as described in Table 3. The all discussed responses revealed that consumers have negative perceptions toward the color of OSDF in some of the medicine characteristics. They associate the color of OSDF with the usefulness of medicine to treat serious diseases, the safety of medicine, and the quality of medicine. Statistical variability in consumers' perceptions toward color of OSDF was demonstrated

according to the demographic characteristics of consumers as described in Table 4.

Table 3: Responses to perception items

Items	Responses n (%)			
	SA	A	DA	SDA
1. Color is related to the effectiveness of medicine.	194 (19.4%) [-]	301 (30.1%) [-]	430 (43.0%) [+]	75 (7.5%) [+]
2. Color is related to the fast acting of medicine inside the body.	1(14.1%) [-]	215 (21.5%) [-]	569 (56.9%) [+]	75 (7.5%) [+]
3. Color is related to the usefulness of medicine for serious problems	265 (26.5%) [-]	475 (47.5%) [-]	234 (23.4%) [+]	26 (2.6%) [+]
4. Color is related to the safety of medicine	240 (24.0%) [-]	430 (43.0%) [-]	304 (30.4%) [+]	26 (2.6%) [+]
5. Color is related to the quality of medicine	520 (52.0%) [-]	413 (41.3%) [-]	52 (5.2%) [+]	15 (1.5%) [+]

Note: SA = strongly agree, A = agree, DA = disagree, SDA = strongly disagree

Table 4: Differences in consumers' perceptions based on the socio-demographic characteristics

Characteristics		Perception Score		P value
		Mean (±SD)	Median	
Gender	Male	10.87 (±2.93)	11.0	0.016*
	Female	10.39 (±3.07)	11.0	
Age group	(18-29)	10.40 (±2.61)	11.0	0.000**
	(30-44)	10.40 (±3.07)	11.0	
	(45+)	11.25 (±3.19)	12.0	
Educational level	Low	8.77 (±2.70)	9.0	0.000**
	Average	10.55 (±2.55)	11.0	
	High	12.36 (±2.77)	13.0	
Monthly income levels	Low	10.33 (±2.79)	11.0	0.206
	Average	10.86 (±3.01)	11.0	
	High	10.55 (±3.240)	11.0	

Males differ significantly in their perceptions toward color of OSDF form females in which Mann-Whitney test approved this difference (P=0.016). For the age groups, the three categorized groups differ significantly in their perceptions toward the color of OSDF. Kurskal-Wallis test detected significant differences among the age group of consumers (P<0.001). For the educational level, another significant difference was detected by Kruskal-Wallis test among the three categorized educational level groups (P<0.001).while, statistical difference was not found among the monthly income levels of consumers (P>0.05).

Discussion:

Colored OSDF was the most preferred characteristics for this type of pharmaceutical preparations. There have been few reports addressing preferences toward colored OSDF in developed countries [3, 12]; while non from Iraq or other developing country. Preference toward colored OSDF was statistically approved by gender, age groups, educational level, and monthly income level of consumers. There is evidence of personal characteristics variation in term of color preferences [13]. Moreover, variation in preferences of colored products by both genders and different age groups were noted previously [14]. For easily differentiation of OSDF, color is an important characteristic for many consumers in which the elderly group is more reliant to it [4]. Since the majority of the elder age groups were in the average educational level and average monthly income level, the characteristic of the color preferences was also important to the later groups. Within the context of the preferred colors, different colors of OSDF were reported in this study and some reasons have been documented. Little is known about the effect of colored formulation of medicines [7]. Some previous investigations showed that consumers have certain preferences of color in OSDF [1, 3]. Meaning of colors was also found with regard to the variety of cultures around the world [7].

With the rising of manufacturing colored medications now a day, a clear message from this study showed that consumers will stop taking the medications they are accustomed to their color if it is remanufactured to another color. This may be important for the pharmaceutical firms to maintain the preferred color of medicine when developing the generic one or managing the life cycle of that medicine. A tendency to mistrust the effect of the prescribed medicine is found if it is not presented in the preferred image [15]. With respect to consumers' perceptions toward color of OSDF; results showed that there is a high level of concern which relates the color with the therapeutic activity of medicine. Although, there is evidence discussed the effect of colored medicine on the therapeutic outcomes but the mechanism still not understood [16]. Historically, this non-pharmacological effect was attributed to the placebo effect [1, 16]. Gender, age groups, and educational level were contributing factors which varied significantly in perception toward the therapeutic benefit of colored OSDF. These findings coincided with that found in other literatures [17, 18].

This study revealed an alarming finding in which the majority of Iraqi consumers perceived the color is related to the therapeutic value of medicines that formulated as OSDF. This concern may further detract treatment acceptance and compliance with treatment program. If the color of medicine was not in accordance with its perceived effect, consumers may not comply successfully with their prescribed treatment [17]. These negative perceptions require more and better education of both consumers and health care providers to avoid poor adherence toward the prescribed medications and wastage of resources in manufacturing colored pharmaceutical products. Evaluating preferences, perceptions concerning colored medications provide a clear picture about how consumers expect, accept, and comply with their prescribed medications.

Conclusion:

Color was the most preferred characteristic of OSDF by consumers with the perceptions that color is related to therapeutic activity of medicines. Gender, age, educational level, and monthly income are important factors that are associated with the preferences and perceptions toward colored OSDF. Given the fact that consumers are the end users of medicines and their preferences may influence comply with treatment, efforts are worthwhile for the prescribe and medicines' manufactures to achieve successful therapy outcomes.

Authors' contribution:

IRI collected the data, performed the analyses and drafted the manuscript. IRI and MI and MA contributed in the planning process of the present study including the choice of study design. MI and MA contributed in providing inputs on study analysis and revised the manuscript during the writing. All authors read and approved the final manuscript.

Acknowledgement:

We would like to thank all the pharmacists who allowed the researchers to interview consumers at their own pharmacies in Baghdad. Further, we would like to thank all the participants for their time to fill up the questionnaires. Financial support for this study was provided by Universiti Sains Malaysia (USM-RU-PRGS).

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