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Drug Use Indicators in Urban and Rural Primary Health Care Facilities in Mansoura District, Dakahlia Governorate, Egypt

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ABSTRACT

Background: The WHO and International Network for Rational Use of Drugs (WHO/INRUD) developed a list of indicators that are broadly used for evaluating irrational drug prescribing. The objective of the current study is to measure drug use indicators in urban and rural primary health care facilitates in Mansoura district.

Patients and methods: A cross-sectional comparative study was carried out on 450 encounters attended urban and rural primary health facilities in Mansoura district, Dakahlia Governorate during the period from October 1, 2016 to September 30, 2017.

Results: Prescriptions of drugs with generic names and prescriptions with antibiotics were 51.9% and 40.9% respectively. The average number of drugs prescribed per encounter was 1.9 (SD 0.41). The average consultation time and the average dispensing time were 7.3 (SD 1.7) minutes and 32.2 (SD 6.9) seconds respectively. Drugs adequately labeled were 57.6% and 52.4% of encounters knew the correct dosage. In addition, 14.7% of encounters were cured without drugs. The average drug cost per encounter at the time of the study was 19.67 (SD 2.92) EGP. Regarding urban-rural inequality concerning drug use indicators, the following were significantly higher in rural than in urban health care facilities (prescriptions with antibiotics, average number of drugs prescribed per encounter, average consultation time, average dispensing time, drugs adequately labeled, percentage of cure without drugs and the average drug cost per encounter at the time of the study).

Conclusion: There is an irrational use of drugs in primary health care facilitates in Mansoura district when investigated by the WHO/INRUD drug indicators.

Keywords: WHO, INRUD**,** Drug use, Indicators, Primary health care, Urban, Rural, Mansoura.

INTRODUCTION

The World Health Organization (WHO) describes the rational utilization of drugs as "patients receiving medications proper to their clinical requirements, in dosages that match their own needs, for a proper period of time, and at the lowest cost to them and their community" [(1)]. Unluckily, the irrational usage of drugs is endemic, particularly in middle- and low-income countries [(2)]. Irrational use of drugs is common in all nations but comparatively greater in developing ones, in which traditional supervision of medicine use is weak [(3)].

Rational drug prescribing participates in global drops in population morbimortality with substantial medical, social and economic advantages [(4)]. Rational prescribing is favored by the WHO/INRUD to evade unwarranted extensive use of drugs and potential adverse events on the cases [(5)]. On the other hand, as researches indicate, the majority of developing nations have a major gap from the WHO/ INRUD recommendations [(6)].

Quality of life (QoL) could be enhanced by improving standards of medical management at all levels of the healthcare delivery system [(7)]. Evaluation of medicine use is of great importance for clinical, educational and economic aims [(8)].

Drug utilization research could be described as an eclectic collection of descriptive and analytical approaches for the quantification, understanding and assessment of the process of prescribing, dispensing and consumption of drugs and for testing of interventions to improve the quality of such processes [(9)]. Different researches were conducted in different nations to access the rationality of drug prescribing. Such researches aim to follow up and assess and after that suggest modifications in prescribing pattern to make the drug use rational and of minimal charge [(10)].

The regular evaluation of drug use pattern in a healthcare facility could help to recognize the drug use problems and as a result to encourage rational drug use and assist policy makers to apply policies on drug prescribing practices in the healthcare facility [(4)]. Essentially, drug utilization researches might provide insights to the pattern of drug use could evaluate the quality of use and identify predictors for use [(11)].

The use of generic name participates in cost reduction and offers more substitutions for drug purchases. Confusion over drug terminology could be associated with adverse events. The use of non-proprietary terminology in medicine must be promoted to save charges, restrict commercial influences and decrease the likelihood for prescribing errors [(12)].

The objective of the current study is to measure drug use indicators in urban and rural primary health care facilitates in Mansoura district**,** Dakahlia Governorate, Egypt.

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PATIENTS AND METHODS

A cross-sectional comparative study was carried out in urban and rural public health facilities in Mansoura district, Dakahlia Governorate during the period from October 1, 2016 to September 30, 2017.

Study Population:

The study included 450 encounters attended the urban and rural primary health care facilities in Mansoura district during the time of the study.

Study location:

Mansoura District was stratified into urban and rural areas. A multistage stratified random sample was carried out to select 10 rural and 5 urban primary health care facilities providing outpatient health services. From each facility 30 encounters were selected randomly to be included in the study. The total number of encounters was 450.

Study Tools:

A questionnaire was used to collect socioeconomic data and data concerning the drug use indicators among the study group. Indicators include:

1. **Drug prescribing indicators:** mean number of drugs per encounter, percentage of drugs prescribed by generic name, percentage of encounters with an antibiotic prescribed and percentage of encounters with an injection prescribed.
2. **Patient care drug use indicators:** number of drugs per encounter, average consultation time, average dispensing time, percentage of drugs actually dispensed, percentage of drugs properly labeled and the patient knowledge of correct dosage.
3. **Complementary drug use indicators:** percentage of patients cured without drugs, percentage of patients satisfied with received care, average drug cost per encounter, average antibiotics cost per encounter and average cost of injectables per encounter.

Data collection and the calculation of indicators were done using the standardized methods described by the International Network for the Rational Use of Drugs, INRUD [6, 13].

Ethical Consideration:

This study was ethically approved by the Institutional Review Board of the Faculty of Medicine, Mansoura University. Written informed consent was obtained from all participants. This study was executed according to the code of ethics of the World Medical Association (Declaration of Helsinki) for studies on humans.

Statistical analysis

The collected data were introduced and statistically analyzed by utilizing the Statistical Package for Social Sciences (SPSS) version 20 for windows. Qualitative data were defined as numbers and percentages. Chi-Square test, Fischer exact test and Monte Carlo test were used for comparison between categorical variables as appropriate. Quantitative data were tested for normality by Kolmogorov-Smirnov test. Normal distribution of variables was described as means and SD, and independent sample t-test was used for comparison between groups. P value ≤ 0.05 was considered to be statistically significant.

RESULTS

Table 1 summarizes the sociodemographic characteristics of the study group. There were statistically significant differences among urban and rural primary health care facilities regarding education, occupation and socioeconomic level.

Table (1): Socio-demographic characteristics of the study group.

Socio-demographic Characteristics	Total (N=450)		Urban (N=150)		Rural (N=300)		Test of significance
	No.	%	No.	%	No.	%	
Age							
< 12 years	21	4.7	6	4	15	5	χ^2=24.8 p=0.18
12 - < 18	42	9.3	13	8.7	29	9.7	
18 - < 65	358	79.6	116	77.3	242	80.7	
≥ 65 years	29	6.4	15	10.0	14	4.7	
Sex							
Male	171	38	66	44	105	35	χ^2=3.44 p=0.06
Female	279	62	84	56	195	65	
Education							
Illiterate	114	25.3	7	4.7	107	35.7	χ^2=36.5 **P<0.001***
Primary	78	17.3	27	18.0	51	17	
Preparatory	35	7.8	6	4	29	9.7	
Secondary	40	8.9	4	2.7	36	12	
University	183	40.7	106	70.7	77	25.7	
Occupation							
Employee	138	30.7	71	47.3	67	22.3	MC **P<0.001***
Merchant	60	13.3	31	20.7	29	9.7	
Professional	52	11.6	6	4	46	15.3	
Laborer	73	16.2	11	7.3	62	20.7	
Farmer	122	27.1	29	19.3	93	31	
Others	5	1.1	2	1.3	3	1	
Socioeconomic level							
Low	220	48.9	47	31.3	173	57.7	χ^2=35.7 **P<0.001***
Middle	189	42	77	51.3	112	37.3	
High	41	9.11	26	17.3	15	5	

χ^2: Chi-Square test MC: Monte Carlo test P: probability *statistically significant (p<0.05)

Table 2 describes and compares the prescribed drug groups in urban and rural primary health care facilities. Antibiotic group was the most commonly prescribed drug group in primary health care facilities (39.2%) and was prescribed more in rural (40.06%) than urban (37.3%) primary health care facilities. Drug groups prescribed significantly more in urban than rural primary health care facilities included NSAIDS (17.5%), oral hypoglycemics (6.8%), anti-hypertensives (5.7%) and antacids (2.6%), while multivitamins and minerals, anti-diarrheals and antihistaminics were prescribed significantly more in rural than urban health care facilities (13.9%, 11.8% and 5.8% respectively).

Table (2): Prescribed drug groups in urban and rural primary health care facilities.

Drug groups	Total		Urban		Rural		Test of significance
	No.	%	No.	%	No.	%	
Prescribed drugs	**882**	100	**263**	29.8	**619**	70.2	
Antibiotics	346	39.2	98	37.3	248	40.06	χ^2=0.61, p=0.44
NSAIDs[1]	78	8.84	46	17.5	32	5.2	χ^2=34.7, **p<0.001***
Multivitamins and minerals	104	11.8	18	6.8	86	13.9	χ^2=8.8, **p=0.002***
Steroids	63	7.14	21	7.98	42	6.78	χ^2=0.401, p=0.526
Cough remedies	84	9.5	26	9.89	58	9.37	χ^2=0.06, p=0.81
Anti-hypertensives	21	2.38	15	5.7	6	0.97	χ^2=17.79, **p=0.0002***
Oral hypoglycemic	32	3.6	18	6.8	14	2.26	χ^2=11.08, **p=0.0008***
Antacids	12	1.36	7	2.6	5	0.81	χ^2=4.73, **p=0.02***
Anti-histaminics	42	4.76	6	2.28	36	5.8	χ^2=5.08, **p=0.02***
Anti-diarrheals	75	8.5	2	0.76	73	11.8	χ^2=28.87, **p<0.001***
Laxatives	22	2.49	4	1.52	18	2.9	χ^2=1.46, p=0.226
Others	3	0.34	2	0.76	1	0.16	χ^{2FET}=1.95, p=0.21

[1]NSAIDs = non-steroidal anti-inflammatory drugs, χ^2: Chi-Square test, FET: Fischer exact test, P: probability, *statistically significant (p<0.05)

Table 3 compares drug prescribing indicators in urban and rural primary health care facilities. Prescriptions of drugs with generic names constituted 51.9%, which was more in urban (56.7%) than in rural (49.9%) health care facilities. Prescriptions with antibiotics (40.9%) were significantly higher in rural (47%) than in urban (28.7%) health care facilities. In addition, prescriptions with injectables (46.7%) were higher in rural (51.3%) than in urban (37.3%) health care facilities.

Table (3): Drug prescribing indicators in urban and rural primary health care facilities.

Prescribing indicators	Total		Urban		Rural		Test of significance
	No.	%	No.	%	No.	%	
Total number of prescribed drugs	882	100	263	29.8	619	70.2	
Number of drugs with Generic names	458	51.9	149	56.7	309	49.9	χ^2=3.35 p=0.07
Number of prescriptions with Antibiotics	184	40.9	43	28.7	141	47	χ^2=4.62 **p=0.03***
Number of prescriptions with Injectables	210	46.7	56	37.3	154	51.3	χ^2=1.31 p=0.25

*χ^2: Chi-Square test P: probability *statistically significant (p<0.05)*

Table 4 summarizes patient care drug use indicators in urban and rural primary health care facilities. The average number of drugs prescribed per encounter was significantly higher in rural than in urban primary health care facilities. Also, the average consultation time was significantly longer in rural than in urban primary health care facilities. The average dispensing time was significantly longer in rural than in urban primary health care facilities. Of the dispensed drugs, 57.6% were adequately labeled which was significantly higher in rural (63.9%) than in urban (43.9%) primary health care facilities. The percent of encounters knew the correct dosage was significantly higher in urban than in rural primary health care facilities.

Table (4): Patient care drug use indicators in urban and rural primary health care facilities.

Patient care indicators	Total (N=450)		Urban (N=150)		Rural (N=300)		Test of significance
	Mean ± SD		Mean ± SD		Mean ± SD		
Number of drugs per encounter	1.9 ± 0.41		1.8 ± 0.3		2.1 ± 0.4		t=8.11 **p=0.001***
Consultation time (in minutes)	7.3 ± 1.7		6 ± 1.4		7.2 ± 1.8		t=6.86 **p<0.001***
Dispensing time (in seconds)	32.2 ± 6.9		26.6 ± 6.51		38.9 ± 7.5		t=16.55 **p<0.001***
	No.	%	No.	%	No.	%	
Prescribed drugs	882	100	263	29.8	619	70.2	
Drugs actually dispensed	604	68.5	191	72.6	413	66.7	χ^2=2.98 p=0.08
Drugs adequately labeled	348	57.6	84	43.9	264	63.9	χ^2=8.86 **p=0.002***
Number of encounters knew the correct dosage	236	52.4	94	62.6	142	47.3	χ^2=15.43 **p<0.001***

t: Student t test χ^2: Chi-Square test P: probability *statistically significant (p<0.05)

Table 5 describes and compares complementary drug use indicators in urban and rural primary health care facilities. The percentage of encounters cured without drugs was significantly higher in rural than in urban primary health care facilities. The average drug cost per encounter at the time of the study was significantly higher in rural than in urban primary health care facilities. Of those costs, average antibiotics cost per encounter was significantly higher in rural than in urban primary health care facilities. Average cost of injectables per encounter was significantly higher in rural than in urban primary health care facilities.

Table (5): Complementary drug use indicators in urban and rural primary health care facilities.

Complementary indicators	Total (N=450)		Urban (N=150)		Rural (N=300)		Test of significance
	No.	%	No.	%	No.	%	
Encounters cured without drugs	66	14.7	14	9.3	52	17.3	χ^2=5.11 **p=0.02***
Satisfied patients with care	207	46.0	61	40.7	146	48.7	χ^2=2.57 p=0.11
Drug cost (by EGP)	**Mean ± SD**		**Mean ± SD**		**Mean ± SD**		
Drug cost per encounter	19.67 ± 2.92		19.51 ± 4.61		26.75 ± 4.59		t=14.62 **p<0.001***
Antibiotics cost per encounter	10.2 ± 2.05		8.13 ± 2.01		12.25 ± 3.03		t=13.37 **p=0.001***
Injectables cost per encounter	13.47 ± 3.23		11.86 ± 2.64		14.28 ± 2.72		t=8.98 **p=0.001***

χ^2: Chi-Square test P: probability *statistically significant (p<0.05)

DISCUSSION

The irrational utilization of drugs happens in almost all nations and exposes people to harm, so the first step for improvement is to study the drug use pattern. The WHO/INRUD developed a list of indicators broadly utilized for evaluating irrational or improper prescribing [(6)].

This study was conducted to measure the drug use indicators in urban and rural primary healthcare facilitate in Mansoura district, Dakahlia Governorate. It included randomly selected 10 rural and 5 urban primary health care facilities providing outpatient health services. Thirty encounters were selected randomly from each facility so that the total number of encounters was 450. A questionnaire was utilized to collect socioeconomic data and data concerning the drug use indicators among the study group [(6)].

In the current work, the total number of prescribed drugs during the study period was 882 (263 in urban and 619 in rural primary health care facilities). Antibiotic group was the most commonly prescribed drug group in primary health care facilities (39.2%) and was prescribed more in rural (40.06%) than urban (37.3%) primary health care facilities. Drug groups prescribed significantly more in urban than rural primary health care facilities included NSAIDS (17.5%), oral hypoglycemics (6.8%), anti-hypertensives (5.7%) and antacids (2.6%), while multivitamins and minerals, anti-diarrheals and anti-histaminics were prescribed significantly more in rural than urban primary health care facilities (13.9%, 11.8% and 5.8% respectively).

Regarding drug prescribing indicators, the current work revealed that, prescriptions of drugs with generic names constituted 51.9 %, which was more in urban (56.7%) than in rural (49.9%) primary health care facilities. That was in line with **Jankovic *et al.*** [(14)] who conducted a study in primary health care facilities in Kragujevac, Serbia, and found that, it was lower than 59%. Moreover, prescriptions of drugs with generic names were 64.1% in rural clinics at Western China [(15)] and 61.2% in Saudi Arabia [(16)].

The optimal level of WHO/INRUD for drugs prescribed by the generic name was 100%. The percentage of drugs prescribed by the generic name is of great importance as this makes information exchange and communications among healthcare providers [(6, 13)]. **Akl *et al.*** [(13)] on their study on 10 primary health care centers in 8 districts in Alexandria governorate, showed that 95.4 (SD 11.4) % of drugs were prescribed by the generic name.

However, **Khafagy *et al.*** [(17)] on their study in Dakahlia governorate, showed that, all prescriptions were brand named rather than generic drugs. That can be probably due to the deficient training programs conducted at that time to improve drug prescription practices. Moreover, in a tertiary care hospital in Ludhiana, India, it was very low (25%) [(18)].

Prescriptions with antibiotics (40.9%) were significantly greater in rural (47%) than in urban (28.7%) primary health care facilities. That was in line with **Khafagy *et al.*** [(17)] who revealed that antibiotics prescribed were 43.6% which was significantly higher in rural (46.4%) than in urban primary health care facilities (39.9%). Moreover, **Dong *et al.*** [(15)] stated that, prescriptions containing antibiotics were 66.05% rural and 62.51% urban. However, the mean incidence of antibiotic prescription increased to some extent in urban facilities (62 to 63%) and decreased in rural facilities (67% to 66%) [(19)]. The WHO/INRUD suggested an optimum incidence of antibiotic prescriptions at less than 30% of whole prescriptions [(6,15)]. Prescriptions containing antibiotics in the current study (40.9%) exceeded those benchmarks. The urban-rural inequality may be attributed to variations in patients' age, gender and clinical diagnosis [(20)].

The current work revealed that, prescriptions with injectables (46.7%) were higher in rural (51.3%) than in urban (37.3%) primary health care facilities. That was in agreement with **Dong *et al.*** [(15)] who found

that the general incidence of parenteral administration was 52.35% in rural and 44.04% in urban health facilities, which was much higher than the WHO optimum value (<10 %) [6]. That was in accordance to the prior researches of **Yang *et al.*** [2] and ***Li et al.*** [21]. However, these results were higher than those of **Ahmadi and Zarei** [22], who carried a study on 103 primary health care centers in Kermanshah Province, Iran and demonstrated that 32.7% of drugs were prescribed in injectable form, which was higher in rural (16.4%) than in urban (15.6%) primary health care facilities. This difference can be attributed to the difference in study subjects and methods.

Regarding patient care drug use indicators**,** the current work demonstrated that, the average number of drugs prescribed per encounter was 1.9 (SD 0.41) and it was significantly higher in rural than in urban primary health care facilities. Similarly, **El Mahalli** [16], on his study on 10 primary health care centers in Saudi Arabia**,** found that the average number of drugs per encounter ranged from 2.0–2.9 with a mean of 2.4 (SD1.2) for the 10 primary health care centers. Moreover, **Alkot *et al.*** [23] and **Akl *et al.*** [13] have demonstrated that the average number of drugs prescribed per encounter was 2.4 (SD 0.7) and 2.5 (SD 0.8), respectively.

The optimal level of WHO/INRUD for the average number of drugs prescribed per encounter must be 1.6 -1.8, that can be explained by the trend of regulations implemented by drug administrators to limit costs of unnecessary polypharmacy [6,13]. The reasonable number of drugs prescribed per encounter in the current study may indicate that primary health care physicians had a tendency towards prescribing only important drugs. However, the results of **Khafagy *et al.*** [17] study displayed a slightly greater average number of drugs per encounter (3.3 ± 0.6) but as the present study, the average number of drugs per encounter was greater in rural (3.7 ± 0.8) than in urban primary health care facilities (2.8 ± 0.7).

In the current work, the average consultation time was 7.3 (SD 1.7) minutes. Similarly, a study conducted in 10 primary health care centers in Saudi Arabia reported a consultation time of 7.3 minutes [16]. Moreover, **Akl *et al.*** [13] revealed that the average consultation time was 7.1 (SD 2.2) minutes. However, **Khafagy *et al.*** [17] have demonstrated that, the average consultation time was 3.7 (SD 1.4) minutes. In the present study, the consultation time considered insufficient enough to conduct proper history taking, full clinical examination, proper health education instructions, and good physician–patient interactions. The optimal level of WHO/INRUD average consultation time should be ⩾30 minutes [6,13,24].

Moreover, the present study revealed that, the average consultation time was significantly longer in rural (7.2 ± 1.8 minutes) than in urban (6 ± 1.4 minutes) primary health care facilities. However, ***Khafagy et al.*** [17] revealed that it was significantly longer in urban (4.2 ± 1.6 minutes) than in rural primary health care facilities (3.1 ± 1.1 minutes). This contradiction can be explained by the under usage of primary health care facilities in urban areas compared with rural ones, and probably due to multiple consultations of more than one family member at once.

The average dispensing time was 32.2 (SD 6.9) seconds and it was very significantly longer in rural (38.9 ± 7.5 seconds) than in urban (26.6 ± 6.51 seconds) primary health care facilities. Similarly, ***Akl et al.*** [13] revealed that the average dispensing time was 47.4 seconds. The optimal level of WHO/INRUD average consultation time should be ⩾90 seconds [6,13,24]. Short dispensing time <60 s isn't enough to clarify dose regimen, adverse events of drugs, entire precautions and actually label and dispense a drug. Prolonged dispensing time is an important step in the context of enhancing patient care. However, **Singh *et al.*** [18] on their study in the tertiary care hospital in Ludhiana, India reported a dispensing time of 340 seconds.

The actually dispensed drugs constituted 68.5% of the total prescribed drugs, that was higher in urban (72.6%) than in rural (66.7%) primary health care facilities. Similarly, **Khafagy *et al.*** [17] revealed that, the dispensed drugs constituted 52.2%, but unlike the current study the dispensed drugs were slightly higher in rural (53%) than in urban health facilities (51.2%). However, **Akl *et al.*** [13] showed that the percentage of drugs actually dispensed was 95.9 (SD 20) %. The optimal level of WHO/INRUD for actually dispensed drugs is 100% [6,13,25].

In the current work, 57.6% of dispensed drugs were adequately labeled, which was significantly higher in rural (63.9%) than in urban (43.9%) primary health care facilities. The optimal level of WHO/INRUD for drugs adequately labeled is 100%. WHO suggests that each drug label must comprise dosage regimen a patient name, as well as drug dose [4,6]. The higher percentage in rural area may be attributed to the request from patient himself to know how the prescribed drug is taken as the educational level is lower in rural than urban areas. However, **Akl *et al.*** [13] found that none of the drugs were adequately labeled where dispensary personnel only write the rate of administration of all drugs on the pillbox or medicines' bag. On the contrary, entire drugs dispensed were properly labeled (100%) in the Tertiary Care Hospital of India [26].

The percent of encounters knew the correct dosage was 52.4% which was very significantly higher in urban (62.6%) than in rural (47.3%) primary health care facilities. The results of **Khafagy *et al.*** [17] study showed nearly the same trend, 67.6% of patients knew the correct dosage, which was higher in urban (73.1%) than in rural primary health care facilities (62.2%). However, **Akl *et al.*** [13] recorded a high patients' knowledge about the correct drug dosage (94 ± 23.8%). The optimal level of WHO/INRUD for patients' knowledge of correct dosage of drugs is 100% [6,13,25].

Regarding the complementary drug use indicators, the current study revealed that, 14.7% of

encounters were cured without drugs, their percentage was significantly higher in rural (17.3%) than in urban (9.3%) primary health care facilities. However, **Khafagy *et al.* [17]** revealed that none of the patients were treated without drugs. The difference may be attributed to the fact that many patients attending primary health care facilities prefer to buy prescribed drugs from private pharmacies, probably due to perceived effectiveness, and physicians are obliged to write these prescriptions outside formal records.

Only 46% of encounters were generally satisfied with received care and that was higher in rural (48.7%) than in urban (40.7%) primary health care facilities. These results were lower than those of **Khafagy *et al.* [17]**, as they showed that, 57.6% of patients attended public health facilities were satisfied with the care they received and that was significantly higher in urban (66.4%) than in rural primary health care (48.7%). This can be explained by the increased number of highly specialized private medical service providers in the last 2 decades versus the lower quality primary health care services in urban areas.

The average drug cost per encounter at the time of the study was 19.67 (SD 2.92) EGP which was significantly higher in rural than in urban primary health care facilities. Of those costs, average antibiotics cost per encounter was 10.2 (SD 2.05) EGP which was significantly higher in rural than in urban primary health care facilities. These results were higher than those of **Khafagy *et al.* [17]**, who showed that, the average drug cost per encounter was 14 (SD 4.7) EGP, which was slightly higher in rural than in urban health facilities. They also revealed that antibiotic accounted for 54.7% of the total drug costs which was significantly higher in rural (59.6%) than in urban primary health care (49.7%). The increased drug cost in the current study could be attributed to the sustained increasing cost of living through last 2 decades.

STRENGTH AND LIMITATION THE STUDY

The adherence to WHO/INRUD drug use indicators to evaluate drug use aspects in Mansoura district provided a lot of strength to the current study. Nevertheless, certain limitations have to be acknowledged. The data was obtained from only 10 rural and 5 urban primary health care facilities which may impact the generalizability of the study. However, bias of selection minimized as possible because primary health care facilities were selected by a multistage stratified random sample. Encounters were spread at frequent intervals across the year utilizing systematic random sampling to reduce the bias owing to seasonal changes of the drug supply chain. Results of the study couldn't demonstrate causes that could be accompanied by irrational use of drugs. However, the current findings are considered a good addition to the limited local data of researches done before in Dakahlia Governorate.

In conclusion, by adherence to the WHO/INRUD drug indicators in the current work, there was an irrational use of drugs in urban and rural primary health care facilities in Mansoura District, Dakahlia Governorate. Therefore, immediate action is required towards the rational use of drugs and proper access to required basic medicine is needed to accomplish universal health coverage.

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REFERENCES

1. **Worled Helath Organization (2002):** Promoting rational use of medicines: core components. World Health Organization, pp. 1-6. https://apps.who.int/iris/handle/10665/67438
2. **Yang L, Liu C, Ferrier J *et al.* (2013):** The impact of the National Essential Medicines Policy on prescribing behaviours in primary care facilities in Hubei province of China. Health Policy and Planning, 28 (7):750-60.
3. **Ofori-Asenso R, Brhlikova P, Pollock A (2016):** Prescribing indicators at primary health care centers within the WHO African region: A systematic analysis (1995–2015). BMC Public Health, 16 (1):1-14.
4. **Abula T, Desta Z, Yohannes A (2002):** Prescribing pattern of drugs in medical wards of three hospitals in northwest Ethiopia. Journal of Ethiopian Medical Practice, 4(1):8-13.
5. **Atif M, Sarwar M, Azeem M *et al.* (2016):** Assessment of core drug use indicators using WHO/INRUD methodology at primary healthcare centers in Bahawalpur, Pakistan. BMC Health Services Research, 16(1):1-9.
6. **Worled Helath Organization (2018):** How to Investigate Drug Use in Health Facilities: Selected Drug Use Indicators. Geneva, Switzerland: WHO. http://www.who.int/medicines/publications/how-to-investigate_drug-use/en/.2018.
7. **Goossens H (2009):** Antibiotic consumption and link to resistance. Clinical Microbiology and Infection, 15:12-25.
8. **Mirza N, Desai S, Ganguly B (2009):** Prescribing pattern in a pediatric out-patient department in Gujarat. Bangladesh Journal of Pharmacology, 4(1):39-42.
9. **Wettermark B (2013):** The intriguing future of pharmacoepidemiology. European Journal of Clinical Pharmacology, 69(1):43-51.
10. **Binu M, Sabbu R, Surendra K *et al.* (2013):** Assessment of drug prescribing practices using who prescribing indicators in a private tertiary care teaching hospital. IRJIPS., 1:26-31.
11. **Furu K, Reikvam Å (2008):** Pharmacoepidemiology–a discipline in rapid progress in Norway. Norsk Epidemiologi., 18(2):126-8.
12. **Schwab M, Oetzel C, Mörike K *et al.* (2002):** Using trade names: a risk factor for accidental drug overdose. Archives of Internal Medicine, 162(9):1065-6.
13. **Akl O, El Mahalli A, Elkahky A *et al.* (2014):** WHO/INRUD drug use indicators at primary healthcare centers in Alexandria, Egypt. Journal of Taibah University Medical Sciences, 9(1):54-64.
14. **Jankovic S, Vasic L, Maksimovic M *et al.* (1999):** An analysis of drug use indicators in primary care health

facilities operating in the city of Kragujevac. Medicus, 3(2):30-6.

15. **Dong L, Yan H, Wang D (2011):** Drug prescribing indicators in village health clinics across 10 provinces of Western China. Family Practice, 28(1):63-7.
16. **El Mahalli A (2012):** WHO/INRUD drug prescribing indicators at primary health care centres in Eastern province, Saudi Arabia. EMHJ-Eastern Mediterranean Health Journal, 18 (11):1091-6.
17. **Khafagy M, Motawea S, Al-wehedy A (1995):** The use of drugs in dakahlia governorate. Egyptian Journal of Community Medicine, 12(2):37-43.
18. **Singh S, Dadhich A, Agarwal A (2003):** A study of prescribing practices in a tertiary care hospital using WHO core indicators. Asia Pacific Journal of Pharmacology, 16(1):9-14.
19. **Yao Q, Liu C, Ferrier J *et al.* (2015):** Urban-rural inequality regarding drug prescriptions in primary care facilities–a pre-post comparison of the National Essential Medicines Scheme of China. International Journal for Equity in Health, 14(1):1-9.
20. **Amaha N, Weldemariam D, Abdu N *et al.* (2019):** Prescribing practices using WHO prescribing indicators and factors associated with antibiotic prescribing in six community pharmacies in Asmara, Eritrea: a cross-sectional study. Antimicrobial Resistance & Infection Control, 8(1):1-7.
21. **Li Y, Ying C, Sufang G *et al.* (2013):** Evaluation, in three provinces, of the introduction and impact of China's National Essential Medicines Scheme. Bulletin of the World Health Organization, 91:184-94.
22. **Ahmadi F, Zarei E (2017):** Prescribing patterns of rural family physicians: a study in Kermanshah Province Iran. BMC Public Health, 17(1):1-7.
23. **Alkot M, Shaheen H, Hathout H (2011):** Prescribing patterns and errors in family practice; a retrospective study of prescribing records. Journal of American Science, 7(11):186-90.
24. **Rabie D, Kheder S (2020):** Assessment of prescribing and dispensing practices based on WHO core prescribing indicators in hospital and community pharmacies in Khartoum State-Sudan. J Med Inf Decision Making, 1(3):1-11.
25. **Nyabuti A, Okalebo F, Guantai E (2020):** Examination of WHO/INRUD core drug use indicators at public primary healthcare centers in Kisii County, Kenya. Adv Pharmacol Pharm Sci., 20:3173847. doi: 10.1155/2020/3173847
26. **Pathak A, Gupta V, Maurya A *et al.* (2016):** Assessment of drug prescribing pattern using WHO indicators in hospitalized patients at a tertiary care teaching hospital in rural area of India. Int J Basic Clin Pharmacol., 5(3):651-5.