J. Fac. Pharm. Ankara / Ankara Ecz. Fak. Derg., 48(3): 835-839, 2024
Doi: 10.33483/jfpau.1473405

ORIGINAL ARTICLE / ÖZGÜN MAKALE

INVESTIGATION OF THE PREVALENCE OF EXPIRED AND UNUSED PHARMACEUTICALS IN THE ANKARA REGION

ANKARA BÖLGESİNDE SON KULLANMA TARİHİ GEÇMİŞ VE KULLANILMAMIŞ İLAÇLARIN YAYGINLIĞININ ARAŞTIRILMASI

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ABSTRACT

Objective: *Due to the increase in the market share of pharmaceuticals and the unconscious use of medicines, unused or expired medicines are being discarded in a way that harms the environment. This study aims to examine which medicines are brought to collection points as household waste in order to reduce waste medicines from the source.*
Material and Method: *The medicines collected in 12 spontaneously selected pharmacies operating in low and high income levels in the Ankara region were recorded at different periods during one year and the results were statistically evaluated. 4852 waste medicines were sorted and classified according to pharmaceutical dosage form and indication*
Result and Discussion: *Unopened 521 medicines were discarded. In addition, it was seen which drug groups create waste in socio-economic terms. In addition to the damage to the environment, it has created a foresight to prevent drug waste that creates a deficit in the budget.*
Keywords: *Environmental awareness, pharmaceutical dosage form, rational drug use, waste medicines*

ÖZ

Amaç: *İlaç Pazar payının artması ve bilinçsizce kullanılan ilaçlardan dolayı, kullanılmayan veya son kullanım tarihi geçmiş ilaçlar çevreye zarar verecek şekilde atılıyor. Bu çalışmada atık ilaçları kaynağından azaltma amacı ile hangi ilaçların evsel atık olarak toplama noktalarına getirildiğini incelemektir*
Gereç ve Yöntem: *Ankara bölgesinde, düşük ve yüksek gelir düzeyinde görev yapan spontan olarak seçilen 12 adet eczanede toplanan ilaçlar, bir yıl boyunca farklı dönemlerde kayıt altına alınıp, sonuçları istatiksel olarak değerlendirilmiştir. 4852 adet atık ilaç tasnif edilmiş ve farmasötik dosaj formu ve endikasyonuna göre sınıflandırılmıştır*
Sonuç ve Tartışma: *521 adet ilaç hiç açılmadan atılmıştır. Ayrıca sosyo-ekonomik açıdan hangi ilaç grupların atık oluşturduğu görülmüştür. Çevreye verilen zararın yanında bütçede açık oluşturan ilaç atığını engellemek için bir ön görü oluşturmuştur.*
Anahtar Kelimeler: *Akılcı ilaç kullanımı, atık ilaç, çevre bilinci, farmasötik dozaj form*

INTRODUCTION

Pharmaceuticals are a combination of materials designed to produce a therapeutic effect on humans or animals. They also have myriads of uses including disease prevention, cosmetics, diagnosis,

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Submitted / Gönderilme : 25.04.2024
Accepted / Kabul : 22.05.2024
Published / Yayınlanma : 10.09.2024

and lifestyle. These pharmaceutics help cure diseases that save lives, however they also ultimately lead to environmental contamination [1]. Pharmaceutical waste contaminants are increasing with an increase in the rate of drug production. Residues from hundreds of widely used active pharmaceutical ingredients can gain entry into the environment [2,3]. The disposal of unwanted, leftover medications to sewage and trash is the primary source of drug pollution. Thus, humans may be exposed to long-term or intermittent exposure to pharmaceutical contaminants, generally through contaminated water and foods.

The disposal of leftover medications poses an acute exposure hazard for both humans and the environment. The increases in pharmaceutical trade and the unsanitary disposal of pharmaceutical waste could pose acute and chronic poisoning risks to humans and wildlife [4,5]. Currently, there is no specific regulation regarding the management of waste pharmaceuticals in our country. However, 'the zero waste regulation' explains how pharmaceutical waste will be collected. According to this regulation, healthcare services such as hospitals, pharmacies and pharmaceutical warehouses are responsible for their pharmaceutical waste. Conversely, municipalities are responsible for the management of waste medicines generated by households [6].

The disposal of pharmaceutical waste in an unconscious manner, for example by pouring it into sinks, directly affects the environment and human health. These unconsciously discarded waste medicines cause contamination of all water resources and thus soil with chemicals. To prevent this situation, such wastes should be disposed of under control. The environmentalists and researchers have advocated the institutionalisation of 'zero waste' as a societal goal, with the intention of spurring waste management agencies to eliminate the need for waste medicine landfills. However, pharmaceutical waste can only be disposed of by incineration, as it is not possible to recycle or recover energy [7]. Therefore, the most reasonable approach is to prevent its generation, in according to the top of the waste pyramid.

According to the municipal sources of Ankara, where our study will be conducted, approximately 8.000 tons of medical waste were disposed of in 2011. In 2020, the pharmaceutical waste disposed of was 14.000 kilograms. In light of the economic burden that these leftover, unwanted pharmaceuticals will bring, it is imperative to prevent their occurrence.

In this study, in order to examine the drug use habits of the people of Ankara, waste medicines collected at random time periods in 15 pharmacies from 2 different eco-social zones were examined. During the course of a year, the waste medicines collected in different periods were classified according to their areas of use and how much of them were used was analyzed.

MATERIAL AND METHOD

Setting of the Study

This was a prospective, single-centre study conducted in two different socioeconomic population areas. The household pharmaceutical wastes collected from the public in different periods from a total of 12 pharmacies in two areas with different purchasing power were analysed. After receiving the necessary information, all waste was left in the collection unit.

Study Period

In 2020, the study was divided into winter and summer periods. A research was conducted on the medicines collected from two of the 12 pharmacies, selected at random, and examined every two months. During the examination, records were taken according to the following categories: indication groups, pharmaceutical dosage forms, and quantities used. For the purposes of comparison, the group with a high purchasing power was referred to as 'Group A' and the other group is referred to as 'Group B'.

RESULT AND DISCUSSION

During our study, 4.852 medicine boxes were examined. Table 1 presents the distribution of collected medicines by drug indication in both groups. Figures 1 and 2 illustrate the percentage distribution of waste medicines. Figure 2 compares the percentage distribution between the two groups.

Figure 3 summarizes data generated according to pharmaceutical dosage formulation. All figures were created in Excel software and comparisons were evaluated by the statistical module.

Table 1. Investigation result according to drug indications (n=4.852)

Group	Cold and Flu	Pain Killer	Antibiotics	Vitamins	Hormones	Cholesterol	Other
Group A	624 (25.59%)	692 (28.38%)	159 (6.52%)	428 (17.56%)	153 (6.28%)	103 (4.22%)	279 (11.44%)
Group B	728 (30.16%)	587 (24.32%)	138 (5.72%)	208 (8.62%)	357 (14.79%)	43 (1.78%)	353 (14.62%)

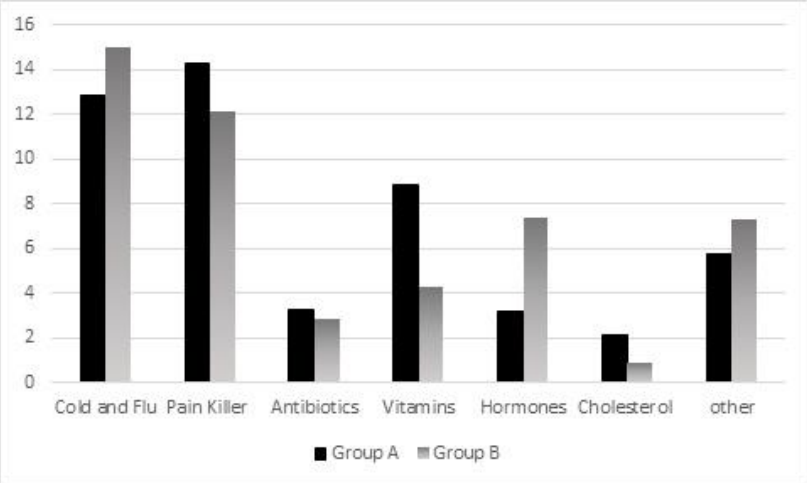

Figure 1. Percentage distribution of pharmaceutical waste according to their indications

According to the findings, although there was a 2% difference between cold medications and painkillers, no statistically significant difference was found ($p<0.05$). While the vitamin and statin group (cholesterol drugs) showed more disposal in the group with a high-income level, hormone drugs showed more disposal in the group with a lower income-level. The fact that the antibiotic group was low in both groups shows that restricting access to antibiotics in line with the rational drug policy implemented in our country is effective [5,7]. Since the period in which the research was conducted coincided with the COVID-19 pandemic, we see that the number of wastage of drugs used in cold and flu infections has increased. In this case, it is seen that our people increase their unnecessary drug intake due to their hoarding habits, and therefore the amount of waste drugs increases (15%). Therefore, different policies regarding rational drug use need to be developed.

It has also been observed that wastes belonging to the vitamin group are generally not pharmacy products. Considering that these products purchased over the internet discarded before they are used up, there is a need to control the sales of this group, whose reliability and effectiveness will be discussed. These products, which do not provide benefits or are not used for other reasons, must be licensed for sale by the necessary authorities under strict control.

When dosage forms of waste medicines are analyzed (Figure 3), it is seen that solid and liquid dosage forms take the first two places. In Group B, the amount of waste generated by liquid dosage forms is quite high. Considering that the majority of liquid dosage forms are in syrup form, it is concluded that the pediatric population is higher in this group. Wastes from creams or ointments, which constitute the semi-solid group, were found to be relatively less and in similar amounts in both groups. The fact that there were almost no products requiring a cold chain reveals that this group only took as much as they needed. Also most of collected drugs were expired (56.75%), and disposed with their original secondary container (46.25%). It is a matter of concern that 10.75% of the total quantity of waste pharmaceuticals were never used.

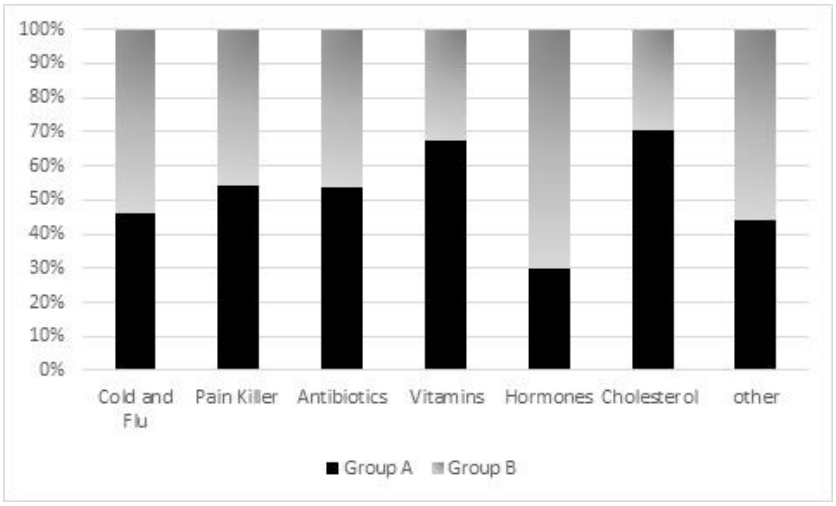

Figure 2. Percentage comparison between two groups of pharmaceutical waste according to indications

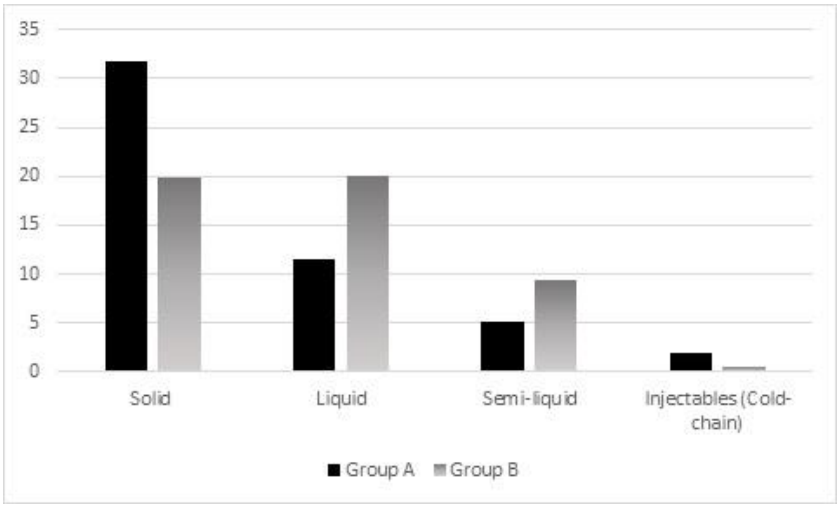

Figure 3. Percentage distribution of pharmaceutical waste according to their pharmaceutical dosage forms

Conclusion

Waste management is a crucial process for all countries. Methods such as incineration and underground burial are employed for non-recyclable wastes, yet these practices have the potential to exacerbate various environmental concerns. A review of studies conducted for the pharmacy and pharmaceutical industry revealed that waste pharmaceuticals are increasingly prevalent in Turkey, with limited disposal options. Unused or wasted pharmaceuticals represent a significant global challenge. The health sector and the consumption of health-related products are growing rapidly. Unfortunately, there is currently no process for the recovery of the waste drug molecule. Consequently, on-site separation and waste minimisation methods are being applied or attempted in Turkey and around the world with the aim of reducing pharmaceutical waste. This study aims to raise awareness and create preliminary studies for larger projects.

ACKNOWLEDGEMENTS

I would like to express my gratitude to Mehmet Saydan, the head of Pharmabotanica Waste Drug

Management System, for his assistance in selecting a pharmacy and for sharing his expertise.

AUTHOR CONTRIBUTIONS

Concept: O.M.S.; Design: O.M.S.; Control: O.M.S.; Sources: O.M.S.; Materials: O.M.S.; Data Collection and/or Processing: O.M.S.; Analysis and/or Interpretation: O.M.S.; Literature Review: O.M.S.; Manuscript Writing: O.M.S.; Critical Review: O.M.S.; Other: -

CONFLICT OF INTEREST

The author declares that there is no real, potential, or perceived conflict of interest for this article.

ETHICS COMMITTEE APPROVAL

The author declares that the ethics committee approval is not required for this study.

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