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Drug and Environment Parameters of Pharmacy Places

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ABSTRACT

This study consists of two parts; the first part is measuring the temperature and relative humidity of twenty pharmacy shops and pharmacy refrigerators in Erbil city. The temperature inside nine types of different drug bottles is also measured. The results show that temperature and humidity inside pharmacy places and refrigerators are higher than the standard temperature (25C°) and relative humidity (35%) of drugs. The temperature inside the drug bottles would be higher if compared with environment temperature. Second parts, the optical properties of the drug bottles are studied by using UV-VIS spectrophotometer, where they are used to analyze the optical properties of the drug bottles. The result shows a maximum value of transmittance ranging from 0% to 88% depending on the types of the drug bottles. Optical transmittance of 25–88% in the visible range has been observed in all samples, high UV transmittance (5%-70%) in %77 samples and infrared (up to 38%-88 % are observed in %88 samples.).

1. INTRODUCTION

The role of environment parameters such as temperature, humidity and light on the stability of drugs is already known. Recently, the study of environment parameter has an effect on the drug stability, internal environment and engineering design of pharmacy place to be an active field of research due to it is important role for human health [1,2]. It is very important that drugs and vaccines are stored at temperature below 30°C, and there are certain drugs must be stored at temperatures lower than 25°C. Higher temperatures lead to change the medicine quality and chemical composition, temperature make these drugs and vaccines less effective. Different Types of Drugs; [Gel – Eye Oint – Creams – Capsule – Ointment] must be Lower than 25ºC. There is a strong relation between chemical and Physical stability of drug and humidity adsorption. The importance of stability testing is obvious in evaluating the efficacy of medicines. Stability studies are important to develop suitable packaging information for medicines quality, Sachan, et.al [3], a medicinal product that is labeled to be protected from humidity and must be stored in no more than 35% relative humidity. Low humidity level is ensured by storing medicines in well-Ventilated area and preventing contact with wall or floor [4]. Humidity level may be so high that carton may soften or collapse [5]. Light can influence the active principle in a drug formulation. A medicines substance or medicines product exposed to sun-rays or bulb light during production, storage. Ultraviolet, infrared radiation and visible light absorb from great majority of drug substances, ointment and pharmaceutical excipients. The result of the absorption first process is a loss of potency of the medicines that will lead to a loss of therapeutic effect of the preparation and formation of toxic degradation products. The energy of UV light is usually higher than the chemical bonds strength and UV light of sunlight forms free radical which affects the physical and chemical properties of chemical composite. Adverse effects due to the formation of minor degradation products during storage [4, 6,15].

Three parameters must be taken in consideration for the drug stability; they are Physical, Chemical, and Microbiological stability, and affect these three parameters in the packing. The materials used for packaging of drug are generally, glass and various grand's of plastics. Glass is one

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of the most commonly used material to save drugs and it is resistant to chemical and physical change, but it has the limitations of plastics include; a broad range of polymers of varying density and molecular weight, physical and chemical properties of each possessing is different [7].

In this work, temperature and humidity of the pharmacy place and refrigerator are measured, transmittance of drug bottles related to band gap found and studied.

2. MATERIAL AND METHODS

Twenty pharmacies in the different places in Erbil city are chosen to measure the temperature, humidity and light. The temperature and humidity data are taken in the date between (15/7/2018) to (15/8/2018) at (2 pm to 4 pm) o'clock. These measurements are taken by using the digital thermocouple thermometer (PASCO-GLX), and for humidity using any meter comfortable meter (model; TH101C), in other part of work nine type of drugs bottles are; (A1: Bronquium, A2: PIYEIOSEPTYL A3:Mamiś Care, A4: Soft Iron + SR, A5: LaRiS, A6: Sunvit Vitamin D3, A7: Zinc – it, A8: Gentle Iron,A9: Acamoxil 125,) taking to measure the temperature inside closed drug bottles and compared with outside temperature of pharmacy as shown in (fig. 1). The data is collected between (2 pm to 4 pm) o'clock. The second part of work, the thickness of each sample (2cm×2cm) from the drug bottles is measured. Using the **UV-VIS** spectrophotometer to study the optical properties of drug bottles, and to show the ability of drug bottles to transfer or reflect the optical light such as; UV , IR , and Visible light.

Fig.1: Sketch of measuring temperature inside nine types of drug bottles by thermocouple.

3. RESULTS AND DISCUSSION

3.1.Temperature of Pharmacy Places

Figure.2 shows the temperature of inside pharmacy and compared with standard temperature of drug (25°C) [3]. The Result shows that the temperature of pharmacies is higher (20% to 60%) than the standard temperature of the drug. The reason of this difference is due to exposure to direct sunlight in some pharmacies, poor ventilation and the small area of some pharmacies, these high temperatures has a negative effect on drug stability which lead to activity losses , and change of concentration of active component , alteration in bio availability , loss of content uniformity , loss of elegance , formation of toxic element, product degradation , and loss of packaging safety [8].

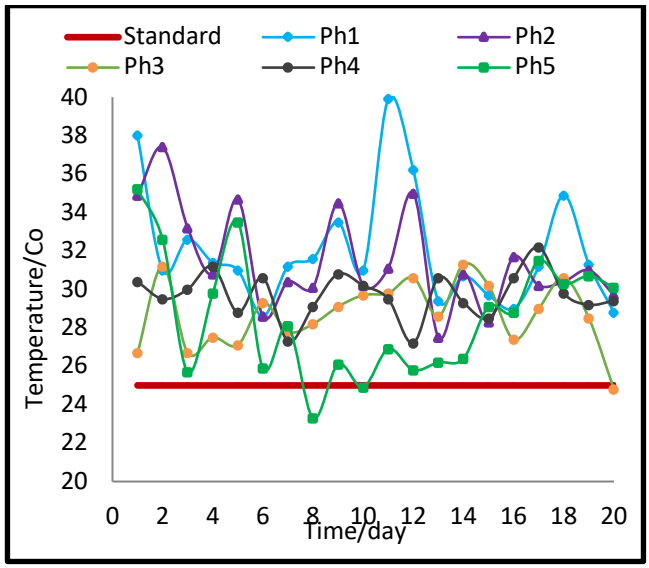


Fig.2: Temperature inside pharmacy per day (zigzag dot line) compared with standard values (linear line).

3.2.Temperature Inside Refrigerate

Standard temperature of the pharmacy refrigerators must be between (2-8°C) [9,10]. Figure. 3, showed the temperature of refrigerator pharmacy and compared with standard value. Results show the refrigerator temperature higher at about (35% to 45%) compared with standard value. if the medicines not stored under controlled temperatures that labile drugs and vaccines decrease in potency, because high temperature accelerate oxidation, reduction and hydrolysis reaction which lead to drug degradation. Acidic and alkaline pH influence the rate of decomposition of most drugs [11,12].

Insulin is one of the sensitive to extreme temperatures and visible light and hence needs to be stored under refrigeration between (2ºC- 8ºC) [9]. Many studies have shown that during storage and use, insulin degraded by hydrolytic reactions or transformed to higher molecular weight components. These studies recommended that insulin

vials should be stored under refrigeration between (2ºC- 8ºC) when the vials are unopened and be protected from sunlight [13, 14]. Vimalavathini et al., have explained that insulin stored at room temperatures (25C°) lose its potency and biological activity [9].

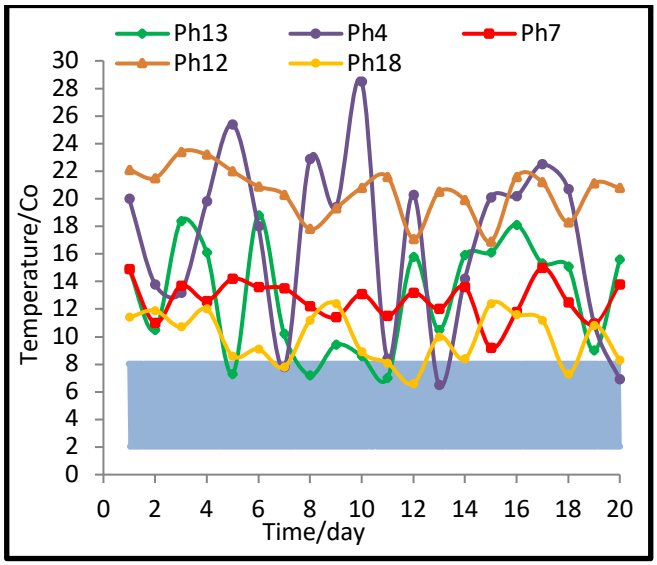


Fig.3: Temperature inside pharmacy refrigerators (zigzag dot line) compared with standard values (blue rectangle region).

3.3.Temperature Inside the Drug Bottles

Thermocouple thermometer is used to measure the temperature inside closed drug bottles. Figure 4, showed the temperature of four types of drug along 60 minute. The internal temperature is higher at about (80% to 92%) compared with outer temperature. The bottles are opaque which means no radiation penetrates the bottles and it prevents any light enters the bottles which is leads to decomposing the drug [11, 12].

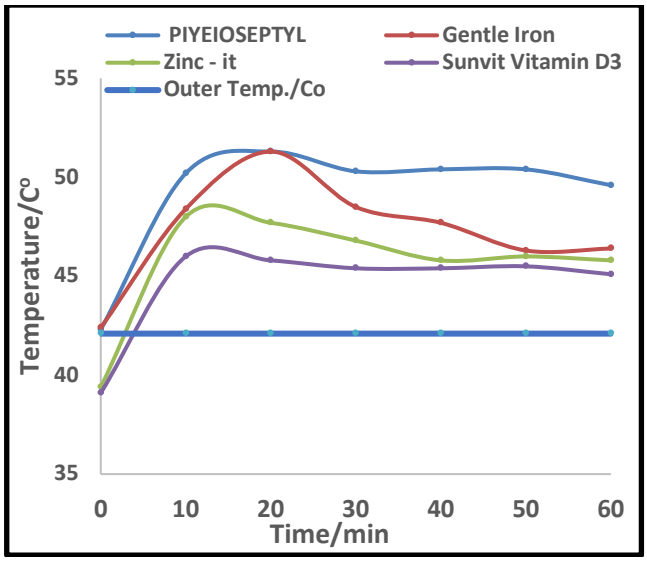


Fig.4: Temperature inside drug bottles for four type of drug with time, environment temperature represent by (linear line).

3.4. Humidity of the Pharmacies

A medicinal product that is labeled to be protected from humidity must be stored no more than 35% relative humidity. Low humidity level is ensured by storing medicines in well-ventilated area and preventing contact with wall or floor [14, 15, 16]. Humidity level may be so high that carton may soften or collapse [5]. Figure5, shows the humidity of pharmacies along 16 days in Erbil city. The result of humidity of all pharmacies is higher at about (63% to 77%) compared with standard value.

3.5.Optical Properties of Drug Bootless

All medications are stored according to manufacturer's recommendations (temperature, light, humidity, sanitation)[16]. Exposure to light is a concern with numerous medications due to the potential for photodegradation or other chemical reactions that affect drug stability [17].

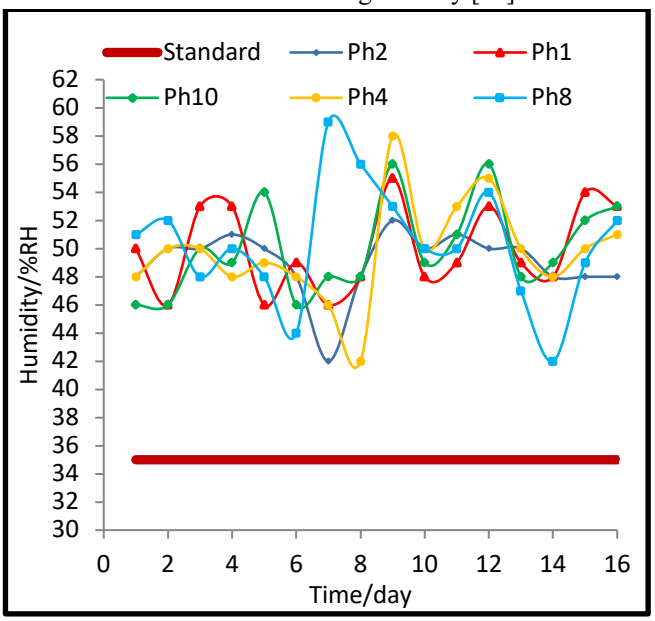


Fig.5: Humidity of five pharmacy along 16 days (zigzag line) compared with standard values (linear line).

Alight-resistant container protects the 10.20.100. Multiple-Unit Container contents from the effects of light by virtue of the specific A multiple-unit container is a container that permits with properties of the material of which it is composed, Some products are photolabile and need

protection from light, then it is necessary doing transmission test for all packaging [18]. Glass, plastic, rubber (natural and synthetic) and metal are the four types of containers commonly utilized for packing drug products, in this work the sample packages where selected is glass.

Figure 6, illustrates the transmission spectra for the different drug bottles from different pharmacies in Erbil city. The transmittances are (30% - 80%) in the IR(infrared radiation) region for all the samples except for sample A3. The transmittances are (20% - 80%) for all samples in the visible region.

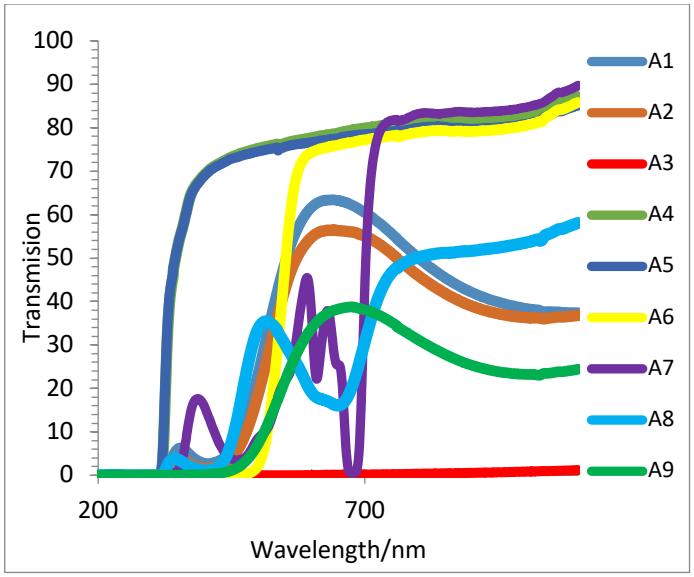
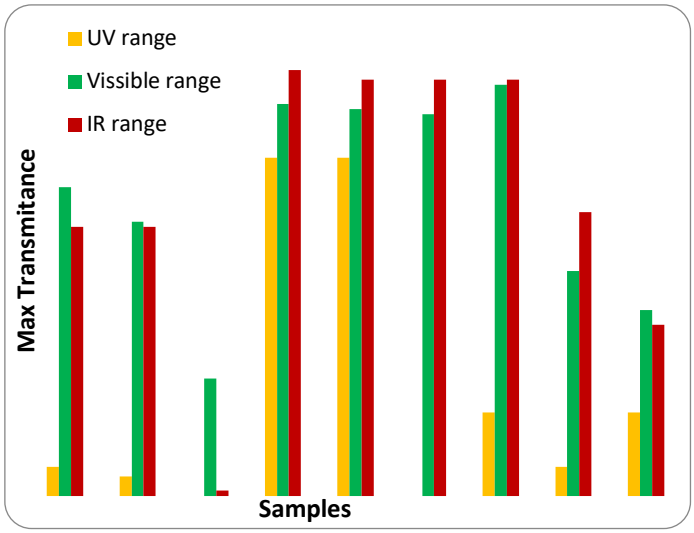


Fig. 6: Transmittance spectra versus wavelength for samples, A1, A2, A3, A4, A5, A6, A7, A8 and A9 of drug bottle at different pharmacies in Erbil city



Transmittances (5% - 80%) in UV region for all the samples except for sample A3, increasing to 700 nm and 725 nm, depicting three regions of optical transitions.

Distribution transmittance of UV, IR and visible light for all drug bottles such as A1, A2, A3, A4, A5, A6, A7, A8 and A9 shown in the (fig. 7) .

Fig. 7: Distribution transmittance for A1,A2,A3,A4,A5,A6,A7,A8 and A9 of drug bottle.

4. CONCLUSION

Environment parameter such as temperature and humidity for all pharmacy places measured, the temperature inside pharmacy refrigerators and drug bottles also measured and compared with standards value. Results of all measurement parameter inside pharmacy shows the higher value of environment parameters compared with standard value of these parameters. Temperature inside the bottle drug is higher than outer temperature whether the bottles are glass or plastic materials. Most of samples transmittance Uv , visible and IR except sample A3.

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الدواء والعوامل البيئية في موقع الصيدليات

عبدالرحمن خليل سليمان و شيدا انوركاكل و لاري حنا صليوه و هوشنك عثمان ابراهيم وكارزان نوري صالح

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الخلاصة:

تتضمن الدراسة :-

اولا قياس درجة الحرارة والرطوبة لعشرين صيدلية و درجة الحرارة لثلاجات الصيدلية في مدينة اربيل. وكذلك تم قياس درجة الحرارة الداخلية لتسعة انواع مختلفة من الادوية. النتائج بينت ان درجة حرارة الصيدليات و الثلاجة اعلى من المستويات القياسية المسموحة وهي لدرجة الحرارة (25C°) ولرطوبة النسبية (35%) بالنسبة للادوية. وتم ملاحظة ان درجة الحرارة المقاسة داخل عبوات الادوية اعلى من درجة الحرارة المحيط.

ثانيا : الخواص البصرية لعبوات الادوية تم دراستها بواسطة استخدام الجهاز (UV–VIS spectrometer) . حيث تم تحليل الخواص البصرية للعبوات الادوية. النتائج بينت ان عامل النفاذية للضوء المرئي هو 25%–88% بالنسبة لجميع نماذج الادوية التسعة المختارة. النفاذية العالية للاشعة الفوق البنفسجية (5%–70%) تم قياسها وملاحظتها في 77% من النماذج ,اما بالنسبة للاشعة تحت الحمراء(IR) فهو (38%–88%) وذلك في 88% من النماذج.

الكلمات المفتاحية: درجة الحرارة. الرطوبة النسبية, الدواء, الصيدلية , النفاذية.