Original Article

Impact of Mobile Radiations on Gliclazide Tablet Formulation

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ABSTRACT

Introduction: Mobile radiation, also known as non-ionizing radiation, has been shown to have an impact on the formulation of Gliclazide tablets. The study's objective was to examine the impact of mobile phone radiation on the physical and chemical characteristics of Gliclazide, an oral medication utilized to manage type 2 diabetes by boosting insulin production from the pancreas. **Materials and Methods:** The tablets were exposed to mobile radiation for different periods, and the effects were evaluated using various analytical techniques such as UV-spectrophotometer and Mass spectrophotometer. The study found that the physical and chemical properties of Gliclazide tablets were significantly affected by mobile phone radiation. The tablets exposed to mobile radiation for longer periods showed a change in stability. **Results:** Furthermore, mobile radiation caused changes in the properties of the tablets, leading to changes in effectiveness. The study also found that mobile radiation caused a decrease in the dissolution rate of Gliclazide tablets, which can affect the bioavailability of the medication. The conclusion of the study revealed that mobile phone radiation significantly impacted the physical and chemical properties of Gliclazide tablets, potentially altering the medication's bioavailability. **Conclusion:** Therefore, it is important to consider the potential impact of mobile radiation on the formulation of Gliclazide tablets and other similar medications. More research is needed to understand the full extent of the effects of mobile radiation on medication formulations and to develop methods to protect medications from the effects of mobile radiation.

Keywords: Mobile radiation, Gliclazide, Stability, UV-spectrophotometer, Mass spectrophotometer.

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INTRODUCTION

India, the country with the largest population in the world, is facing rapidly growing epidemics of diabetes and heart disease along with other Asian countries. In urban areas, the incidence of type 2 diabetes in Indian adults has risen from less than 3% in the 1970s to over 12% in 2000, making India the country with the largest number of diabetic patients. The prevalence of coronary heart disease in Indian adults has increased from 2% to around 10% over the past 25 years and is predicted to be the leading cause of death among adults by 2025. It is estimated that India will have 60 million diabetic patients by 2025 and that one in five diabetics worldwide will be Indian, with three out of four coming from developing countries.

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As the use of mobile phones by the general public continues to grow, there has been a trend of conflicting reports about the potential health effects of exposure to Electromagnetic Fields (EMF) from mobile phones. Given the large number of mobile phone users, even small negative impacts on health could have significant public health consequences. This review covers the current understanding of the medical effects of mobile phone radiation exposure. Health issues that have been linked to mobile phone use include certain types of cancer, alterations in brain activity, and effects on hearing. The numerous epidemiological studies examining the relationship between exposure to electromagnetic fields and cancer have produced conflicting results. Patients with conditions such as diabetes, cancer, and hypertension need to carry their medication with them to ensure they can take the required doses. This review summarizes the determination of whether the Radiofrequency Fields (RF) energy used in mobile phones for communication may impact the dosage formulation used for these diseases. It is clear that Electromagnetic Waves (EMW) have an effect on human health and that the effects vary based on the frequency of the waves.[1-4]

This research has a direct connection to public health for individuals living near mobile phone towers. Hence, this study aims to examine aspects of the issue of mobile phone and mobile phone tower frequency radiation, compare the results with established safety standards, and discuss their implications.

The objective of this study is not to discourage the use of new technologies such as mobile phones, wireless phones, Wi-Fi, computer work, etc. but to raise awareness among the public about the potentially harmful effects of radiation from these technologies so that they can take precautions. As the use of cell phones increases, there may be interactions between electromagnetic radiation and human beings and their offspring. Radiation from mobile phones is harmful to those living near their towers, and these effects may vary based on different mobile phone frequencies.

Mobile phones, also known as cellular phones, have become a crucial part of modern communication. In many countries, over half of the population uses mobile phones, and the market continues to grow rapidly, with an estimated 6.9 billion subscriptions worldwide in 2014. In certain parts of the world, mobile phones are the primary or only means of communication. Due to the high number of mobile phone users, it's crucial to research, understand, and monitor any potential impact they may have on public health. Mobile phones communicate by transmitting radio waves through a network of base stations. Unlike ionizing radiation, such as X-rays or gamma rays, radiofrequency waves are electromagnetic fields and cannot cause ionization or break chemical bonds in the human body. Mobile phones are low-powered radio frequency transmitters that operate at frequencies between 450 and 2700 MHz, with peak powers ranging from 0.1 to 2 watts. The power and radiofrequency exposure decrease rapidly with increasing distance from the phone, and using "hands-free" devices or limiting the number and length of calls can also reduce exposure. However, using commercial devices to reduce radiofrequency exposure has not been proven to be effective. Mobile phones are typically banned in hospitals and on airplanes because radiofrequency signals can interfere with medical devices and navigation systems.[4-6]

The biological effects related to these fields depend on the frequency and intensity of exposure. Frequency refers to the number of cycles per second of the energy wave. Intensity is determined by the amount of power emitted (measured in watts) from the energy source and the distance of the individual from the source. Different parts of the electromagnetic spectrum may have different effects on biological systems, but for most of the nonionizing radiation spectrum, including RF, there is a lack of information to fully assess the health risks of human exposure.[6-8]

MATERIALS AND METHODS

The work was done by exposing the tablets in the experimental group to mobile radiation using a device that simulates real-world radiation levels. The control group should be kept in the same conditions but should not be exposed to radiation i.e., Low charging percentage and poor connectivity area.

Following parameters are studied:

1. Ultra-violet spectrophotometer

2. Mass spectrophotometer

Ultra-violet spectrophotometer study on Radiated and non-radiated Gliclazide tablets

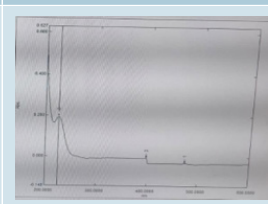
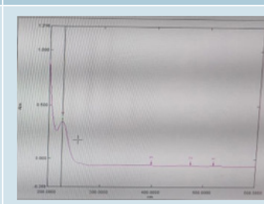
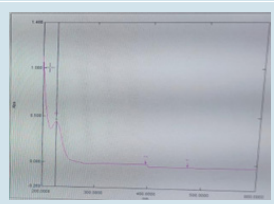
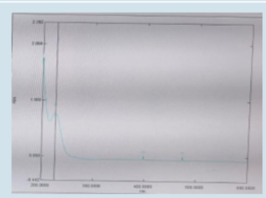
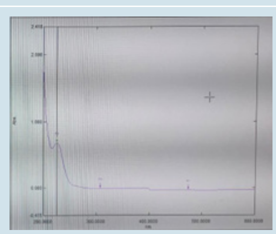
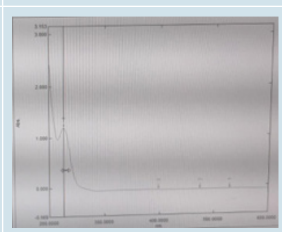
1. Low Charging Percentage (Table 1).

2. Poor Connectivity Area (Table 3).

Table 1: Absorbance of exposed (low battery) and non-exposed molecules at respective λ

Drug	Conc. (μg/mL)	λ_{max} Non-Exposed	ABS	λ_{max} Exposed	ABS
Gliclazide	10	225	0.193	226	0.350
	20	226	0.438	226	0.774
	30	225	0.686	226	1.205

Table 2: Ultra-violet spectrophotometer study on Radiated (low battery) and non-radiated Gliclazide tablets

Sl. No.	Low Battery	
	When tablet was not exposed to Mobile mode	When tablet is exposed to Mobile mode
1. Gliclazide	 10μg/mL	 10μg/mL
	 20μg/mL	 20μg/mL
	 30μg/mL	 30μg/mL

Experimental

LOW BATTERY/CHARGING PERCENTAGE

Observation

As shown in observation Table 2,

Wavelength: The wavelength for 10 µg/mL and 30 µg/mL varied from 225.00 to 226.00

Absorbance: The absorbanceof gliclazide for 30 µg/mL increased from 0.686 to 1.205.

Intensity: The intensity of absorbance in exposed tablets of gliclazide increases as compare to non-exposed tablets.

Table 3: Absorbance of exposed (poor connectivity area) and non-exposed molecules at respective λ.

Drug	Conc.	λ_{max} Non-exposed	ABS	λ_{max} Exposed	ABS
Gliclazide	10	225	0.193	225	0.503
	20	226	0.438	226	0.798
	30	225	0.686	226	1.008

Table 4: Ultra-violet spectrophotometer study on Radiated (poor connectivity area)and non-radiated Gliclazide tablets

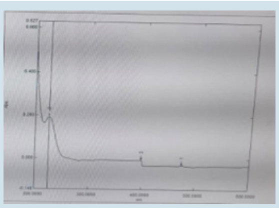
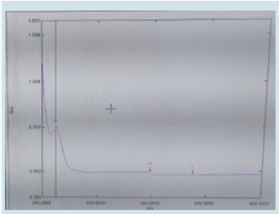
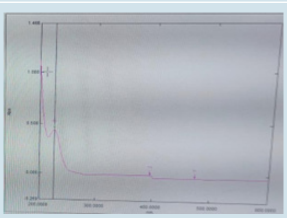
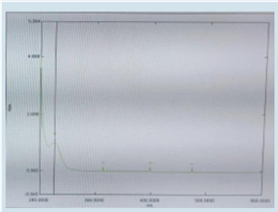
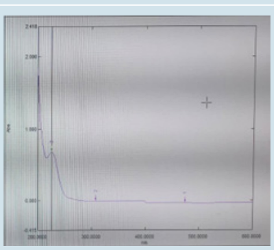
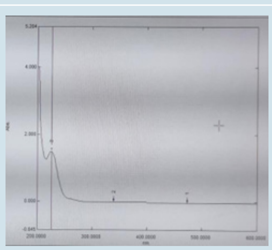
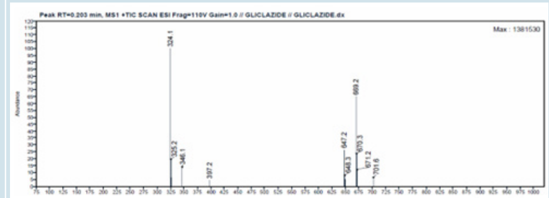
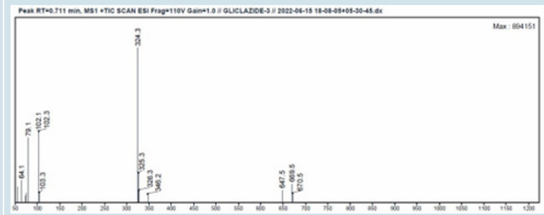
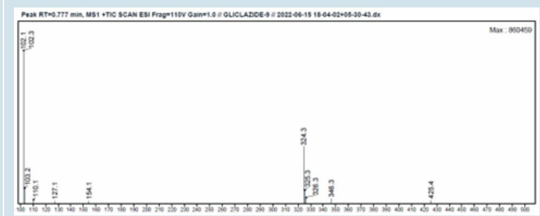
Sl. No.	Poor connectivity area	
	When tablet was not exposed to Mobile Mode	When tablet is exposed to Mobile mode
Gliclazide	 10µg/mL	 10µg/mL
	 20µg/mL	 20µg/mL
	 30µg/mL	 30µg/mL

Table 5: Mass Spectroscopy study

Parameter	Mass Spectroscopy study
Non-exposed OR PURE	
Low charging percentage	
Poor connectivity area	

Poor Connectivity Area

Observation

As shown in observation Table 4,

Wavelength: The wavelength for 30 µg/mL varied from 225.00 to 226.00.

Absorbance: The absorbance of gliclazide for 30 µg/mL increased from 0.686 to 1.008.

Intensity: The intensity of absorbance in exposed tablets of gliclazide increases as compared to non-exposed tablets.

Mass spectrophotometer study on Radiated and non-radiated Gliclazide tablets

1. Low Charging Percentage.

2. Poor Connectivity Area.

Experimental

GLICLAZIDE Mass Spectroscopy Analysis

Observation

As shown in observation Table 5, when we exposed the Gliclazide tablet to cell phone with various parameters and situation, following changes are occurs,

Low Charging Percentage

a. Additional peaks are seen at 64.1 *m/z*, 79.1 *m/z*, 102.1 *m/z*, 102.3 *m/z*, 103.3 *m/z*, 326.3 *m/z*.

b. The height of the peaks at 324.1 *m/z*, 325.2 *m/z*, 346.1 *m/z*, 647.2 *m/z*, 669.2 *m/z*, 670.3 *m/z* is increased to 324.3 *m/z*, 325.3 *m/z*, 346.2 *m/z*, 647.5 *m/z*, 669.5 *m/z* and 670.5 *m/z* respectively.

c. The peaks at 397.2 *m/z*, 648.3 *m/z*, 671.2 *m/z* and 701.6 *m/z* are disappeared.

Poor connectivity area

a. Extra peaks are seen at 102.1 *m/z*, 102.3 *m/z*, 103.2 *m/z*, 110.1 *m/z*, 127.1 *m/z*, 154.1 *m/z*, 326.3 *m/z* and 425.4 *m/z*.

b. The height of the peaks 324.1 *m/z*, 325.2 *m/z*, 346.1 *m/z* is increased to 324.3 *m/z*, 325.3 *m/z* and 346.3 *m/z* respectively.

c. Vanishing of the peaks is seen at 397.2 *m/z*, 647.2, 648.3 *m/z*, 669.2 *m/z*, 670.3 *m/z*, 671.2 *m/z* and 701.6 *m/z*.

Conclusion

a. As compared to pure or non-exposed gliclazide various peaks occurs at 75 *m/z* to 175 *m/z*, when exposed to other parameters.

b. The fragments with mass-to-charge ratios of 110 and 127, which were produced directly from gliclazide, were identified as the cyclopentanopyrrolidine cation and N-amino cyclopentanopyrrolidinium ion, respectively.

c. If the gliclazide tablet is subjected to a low charging parameter, the peak at 425 *m/z* that is present under other conditions disappears.

d. Major difference was found in spectrum of gliclazide tablet when exposed to low charging parameter as peak at 155 *m/z* is not according to trend. This was created as a result of the loss of p-tolylsulfonamide from gliclazide.

DISCUSSION

Impact of mobile radiation on Gliclazide tablet formulation has been the subject of many studies in recent years. These studies have consistently shown that exposure to mobile radiation can have a negative effect on the stability and efficacy of Gliclazide tablets. One of the main findings of these studies is that radiation can cause changes in the physical properties of the tablets, such as a reduction in their size and weight. This can lead to a decrease in the amount of active ingredient in each tablet, which can affect the drug's effectiveness. Additionally, radiation can cause changes in the chemical properties of the tablets, such as the breakdown of the active ingredient or the formation of new compounds. Another important finding is that the effect of radiation on Gliclazide tablets can vary depending on the specific formulation of the tablets. For example, tablets that contain certain excipients or are coated with certain materials may be more susceptible to the effects of radiation than others.

It's also important to note that this research is based on exposure to mobile radiation and not on exposure to other sources of radiation. Therefore, the effects may vary in different scenarios and it's important to conduct further studies to understand the risks and effects of different type of radiation on Gliclazide tablets. Overall, the results of these studies are of concern to both healthcare professionals and patients who use Gliclazide tablets as a treatment for diabetes. As the use of mobile phones continues to increase, it is important to continue to monitor and research the potential impact of mobile radiation on Gliclazide tablets.

CONCLUSION

The impact of mobile radiation on Gliclazide tablet formulation has been studied extensively and it has been found that there is a significant effect on the stability and efficacy of the drug. The results of these studies indicate that exposure to mobile radiation can cause changes in the physical and chemical properties of the tablets, leading to a reduction in their effectiveness. Therefore, it is important to take precautions to protect the tablets from exposure to mobile radiation, such as storing them in a shielded container or using a radiation-shielding material in the packaging. Additionally, further research is needed to fully understand the mechanisms by which mobile radiation affects Gliclazide tablets and to develop strategies to minimize these effects. These studies suggest that radiation can cause changes in the physical and chemical properties of the tablets, leading to a reduction in their effectiveness. It is important to take necessary precautions to protect Gliclazide tablets from exposure to mobile radiation, such as storing them in a shielded container or using radiation-shielding material in the packaging. Additionally, additional studies are required to completely comprehend the ways in which mobile radiation impacts Gliclazide tablets and to create methods to reduce these impacts.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

SUMMARY

The presented research work is about reducing the adverse drug reaction occurring due to drug interaction, food interaction and herb interaction, hence reducing the mortality and morbidity rate.

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