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The Effect of Cell Phone on Seminal Volume: A Comparative Study on Human

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Abstract
Recent advancement in mobile technology has drawn attention to their biological effect. Further, an exponential increase in mobile phone number has led to widespread concern. A recent report by TRAI, as on dated 30th September 2018, the overall telecom subscriber base has reached 1191.40 million populations in India. The present work is aimed to study the effect of cell phone on seminal volume. For this, the seminal volume of 150 (71 non-users and 79 different duration mobile phone users) human subjects of 19-35 years of age group has been employed. The result showed a decreasing trend in different duration mobile phone users in comparison to non- users/ normal men. A significant ($p<o.o5$) decrease in a human subject who were using a mobile phone from 06-09 years of duration and keeping their mobile phones near waist pockets, a highly significant ($p <0.001$) decrease in human subjects using mobile phones from ≥ 10 years duration. A further standardized study is needed to assess the risk of mobile phone use on the reproductive system.

Keywords
Radiofrequency, Mobile phone, Seminal volume.

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INTRODUCTION
Semen is a white or grey liquid, emitted from the urethra on ejaculation. Usually, each millilitre of semen contains millions of spermatozoa, but the majority of the human semen is a mixture of components, produced by several different accessory glands. Testicles and Epididymis produced only 5 % of the total volume. Rests are contributed by Seminal vesicles from 46 to 80 %, Prostate gland from 13 to 33 %, and the small portion 2 to 5 % from Bulbourethral and Urethral gland. The components are incompletely mixed during the course of ejaculation and, hence, initial ejaculate is not an entirely homogenous mixture. Thus, Seminal vesicles which contribute the majority of the ejaculate (Polakoski et al., 1976; Mann And Lutwak- Mann, 1981; Coffey, 1995). The secretions of the organs contributing to the ejaculate differ in composition, and there has been a longstanding interest evaluating the composition of semen from a different point of view.

Semen and its major constituents like, as an important determinant used conventionally to assess human fertility as well as used to screen for exposure to reproductive toxicants (Lamb, 1994). Lewis, (2007) was the opinion that sperm concentration in semen and spermatozoa motility was the most powerful discriminators of fertility in human beings. Infertility, defined as the inability to conceive after one year of regular, unprotected sexual intercourse, affects

approximately 15% of couples during their reproductive lifespan, Eisenberg ML, et al., 2015. Dasdag S, et al. 1999, the mobile phone may induce histological changes in the testes of the rat.

A recent report by TRAI, as on dated 30th September 2018, the overall telecom subscriber base has reached 1191.40 million populations. TRAI indicated that the number of mobile phone users increasing at a rate of 0.20% per months. In recent years the possible health effects of occupational or residential and mobile phone exposure to their power frequency and magnetic field have become a matter of serious concern with respect to health hazards and on reproduction. In the human body eyes, breast and testicles have electrical characteristics as they absorb radiofrequency radiation much more highly than any other external part. Precise measurement of volume is essential in any evaluation of semen because it allows the total number of spermatozoa and non-sperm cells in the ejaculate to be calculated. Therefore, in this context, a study has been undertaken to evaluate the seminal volume of different duration mobile phone users' human subjects and non-users' human subjects to assess the reproductive hazards in human seminal physical parameters.

MATERIALS AND METHODS

In this investigation, the methods adopted here are WHO standard methods prescribed in WHO laboratory manual for the examination and processing of human semen - 5th edition, (2010) ISBN 978 92 4 154778 9. For this 150 young adult, healthy male subjects (71 never used mobile phones and 79 mobile phone users) of 19-35 years of age group were employed. All the subjects were selected on the basis of a questionnaire containing the question related to usage of mobile phone like the habit of carrying the mobile, duration of use. Subjects using mobile and keep it in their waist pocket were categorized into three groups and the subjects who never used mobile phone were regarded as control/normal.

Group 1- Normal/control.

Group 2- using the mobile phone since 01-05 years of duration.

Group 3- using the mobile phone since 06-09 years of duration.

Group 4 – More than 10 years of duration.

Semen from all categories of human subjects was collected by masturbation with abstinence of minimum five days. Their semen was collected in dry, clean, sterilized, graduated propylene, wide mouth tube. Read the volume directly from the graduations (0.1 ml accuracy).

RESULT & DISCUSSION

As indicated in Table 1, the seminal volume in human subjects a decreasing trend in different duration mobile phone users in comparison to non- users/ normal men. A significant ($p<o.o5$) decrease in a human subject who were using a mobile phone from 06-09 years of duration and keeping their mobile phones near waist pockets, a highly significant ($p <0.001$) decrease in human subjects using mobile phones from ≥ 10 years duration, were observed in comparison to non- users. This decrease was significant ($p<0.05$) in 06-09 years mobile phone users to 01-05 years of duration users and was highly significant ($p<0.001$) in ≥ 10 years duration was in comparison to 01- 05 years duration users human subjects.

Table 1: Seminal volume in non-users and different duration mobile phone users' human subjects.

Serial number	Duration & categories of mobile phone users (in years)	Level of ejaculate human seminal volume (in ml.) (mean ± SE of the sample)
1.	Non-users [a] (71)	3.544±0.176
2.	01-05[b] (24)	3.384±0.135
3.	06-09[c] (45)	2.903±0.158
4.	≥10[d] (10)	2.589± 0.152

(Number in parenthesis indicates the number of samples)

P-value: - (a to c= p < 0.05, a to d= p < 0.001, b to c= p < 0.05, b to d= p < 0.001)

Our findings support the view that mobile phone frequency affects the reproductive function in human beings. Semen and its major's constituents like volume as an important determinant used to

access human fertility as well as used to screen for exposure to reproductive toxicants and to set their regulatory levels, Lamb, (1994). An earlier report of Giwercman and Skakkebaek, (1992) indicated that deterioration & reduction in semen quality and quantity often attributed to environmental toxicants. Human semen, the non - gametic portion of ejaculate is composed of cells, cellular particles, and fluid from the testis, excretory ducts, and accessory sex glands of human male subjects. Earlier findings of Polakoski and Koptam, (1982) support the view that seminal plasma influences the fertility potential of spermatozoa. Some of the seminal constituents are organ-specific, and their concentrations can be useful for assessing the secretory capacity of the various sex- glands whose development and secretion are controlled by androgens produced in the testis known as testosterone. Earlier Polakoski et al., (1976) was the opinion that seminal fluid acts as a medium for the transport of male gamete, spermatozoa, into the female reproductive tract, and it acts as buffered medium that contains nutrients for spermatozoa in a species-specific volume and sperm density. The formation and composition of ejaculated semen are dependent upon testicular hormone. Intrinsically testosterone is linked with reproduction and seminal fluid by the accessory sex glands. Hirsh, (2001) reported that seminal volume is a parameter which indicates the sexual arousal.

On the other side, the process of ejaculation is a sequential neurological event on which seminal volume depends. A significant decrease in lower duration use of mobile phone and highly significant decrease during higher duration mobile phone users in human subjects in comparison to non-users might be an indication of mobile phone frequency effect on a neurological level. As recent findings of McCartya et al., (2011) reported that mobile phone its using mode connected to ear and brain which ultimately produces a neurological syndrome, which he marked as electromagnetic hypersensitivity. This neurological syndrome might be responsible for the decrease in ejaculated seminal volume in subjects using mobile phones at different durations.

Earlier findings of Bortkiecwicz et al., (2001) indicated that radiofrequency electromagnetic field exposure can affect FSH &LH secretion in the pituitary gland. This might be responsible for decrease seminal volume in different duration mobile phone users' human subjects. As undoubtedly the process of reproduction is under the control of the nervous and endocrine system.

CONCLUSION

While a lot of paper has been published on the biological effect of the radiation emitted by mobile phone on semen quality, many are contradictory and need to be studied in detail. As for human studies, although the defined effect of mobile phone radiation on semen quality cannot be concluded from the existing studies, men should not keep a mobile phone in their trousers pockets or near testicles to avoid the potentially harmful effect of radiation on the male reproductive system. Further, well designed and standardized case-control and cohort studies are needed to identify the effect of radiation of mobile phone on semen quality and the association between mobile phone use and infertility.

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