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Original Research Paper

Ayurveda

LEVEL OF GOLD IN SEMEN AT GOLD MINE AND NON-GOLD MINE AREAS

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ABSTRACT **BACKGROUND:** The first report about the presence of gold in semen appeared in 1981. This study is a follow up .To find out the level of gold in semen of men nearer to a gold mine and a place far away from any gold mine. **METHODS:** A total number of 32 normal healthy volunteers (age 21-33 years) were recruited for the study. Their semen samples were evaluated on the basis of total sperm count and percentage of sperm motility and semen samples were processed for analysis of gold. **RESULTS:** The gold was present in all samples. It was present less in samples from gold mine area. **CONCLUSIONS:** The choice of instrument for gold estimation in semen of gold mine area was probably not proper and maybe the responsible factor for showing less gold in semen

KEYWORDS : Male fertility, Gold in semen, Gold mine area, Kolar, Jamnagar

INTRODUCTION

Male infertility is a serious health issue. Many reports are available showing its high incidence (Chaitrali et al. 2019; Mehra et al.2018; Prasad et al. 2011; Skandhan, Mazumdar 1982; Skandhan et al. 1982;1986). Semen examination is the prime tool in establishing the status of male fertility. Several detailed studies paid attention on functioning of male genital tract in general, accessary glands in particular and its secretion. Understanding the details of semen is important (Mann 1964). Workers concentrated on exploring different aspects of semen. Keen observations and interpretations of laboratory investigations improved the knowledge on male fertility by identifying several responsible factors for it. A change in any one or more factors may lead to infertility. Deterioration of semen quality attained attention. Possible reasons for which were sought.

Identification of organic and inorganic substances present in semen gathered attention. Fertility status was correlated to each one of these. Studies on inorganic substances are limited, though several elements were identified (Eliasson, Lindholmer 1971; 1972; Skandhan, Abraham1984; Skandhan et al.2007). Presence of gold in semen was reported in 1981(Skandhan). The utility of gold in semen is not fully known. Attempts are being made to understand the possible functions of the metal in fertility. Semen samples from infertile men showed gold level as less in comparison to that of samples from the normal (Skandhan et al.2010 ; 2016) . A study showed fertility rate as higher in gold mine area (Prasad et al. 2011).

The aim of the study is to find out semen quality and the level of gold in people of a gold mine area and compare to that of a non-gold mine area.

MATERIALS AND METHODS

Initially the proposal of the study was approved by the Research Committee and the Ethical Committee of this institution. In this study semen samples were collected from two different places,1. Kolar in the Province of Karnataka where a gold mine field is present and 2. Jamnagar in the Province of Gujarat, situated 1830 km away from the nearest gold mine field. After getting consent from healthy ten donors from healthy Kolar gold mine area and twenty two from non-gold mine area in the age group of 21-33 years, were included in the study. They were advised to supply semen samples. All precautions were taken during collection of samples. Prior to collection they were to maintain an abstinence of 3-5 days (Skandhan et al.1985). Collection of sample was done by masturbation at a place provided close to the laboratory. The time of collection was fixed at 8.00 am (± 30 minutes). Sample was to be collected in a well cleaned, wide mouthed bottle provided from the laboratory. Semen examination was done with utmost care as per led down criteria (WHO 1975). Light intensity in laboratory was constantly maintained as light is known to alter sperm motility (Veena et al.2012).

Extreme care was taken for cleanliness of glass wares. Glass wares used in this study were dipped overnight in 6N Nitric acid, washed in tap water, distilled, double distilled and triple glass distilled water and were dried in hot air oven (at 150°c) except volumetric or calibrated glass wares which were placed on filter paper for drying (Skandhan et al.2011).

Samples from gold mine area were pooled and individual samples from non-gold mine area underwent the process of wet oxidation (Reitz et al.1960; Skandhan et al.1986).

After taking all precautionary care, sample from gold mine area was analysed for gold by employing ICP-MS available at National Geographical Research Institute at Hyderabad and samples from non-gold mine area were estimated for gold employing ICP-AES available at National Institute of Technology, Bombay.

RESULTS

The results of the study are given in Table 1 & 2. The level of gold in semen of gold mine area was lower than non-gold mine area (Table 1)

Table 1. Results of study in gold in semen of normozoospermia compared with other studies.

Authors (year)	Place	Instrument Employed	Values in ppm
Skandhan (1981)	NGA*	NAA[1]	0.05&0.02

Skandhan et al. (2010)	NGA*	AAS[2]	0.337&0.41
Sahabkhan et al. (2011)	NGA*	AAS[2]	0.68
Jain et al. (2010)	GDA**	AAS[2]	0.88
Skandhan et al. (2016)	NGA*	AAS[2]	0.17
Present Study	GMA***	ICP-MS[3]	0.000765
	NGA*	ICP-AES[4]	0.243

*No gold area 1. Neutron Activation Analyser.
**Gold deposit area 2. Atomic Absorption Spectrophotometry
***Gold mine area 3. Inductively Coupled Plasma Mass Spectrometry
4.Inductively Coupled Plasma Atomic Emission Spectroscopy
AZ (2)0.206

Table 2. Results of gold in semen in clinical samples compared with other reports

Authors(year)	Area of Study	Type of Sample(n)	Value in ppm
Skandhan et al. (2010)	Non gold area	OLZ (3)	1.3
		OLAS (8)	3.1
		AS (4)	3.5
		AZ (3)	0.3
Skandhan et al. (2016)	"	OLZ (23)	0.13
		OLAS (44)	0.205
		AZ (19)	0.215
Present study	"	OLZ (10)	0.0243
		AZ (2)	0.206

OLZ=Oligozoospermia
OLAS=Oligoasthenozoospermia
AS=Asthenozoospemia
AZ=Azoospermia

DISCUSSION

Clinicians and scientists are placing efforts to explore different unknown causes of male infertility. Many factors were considered in this respect. Different groups of workers are involved to find out the details of male fertility and infertility.
When a couple reports to a clinician for infertility, semen examination, the prime laboratory investigation for male partner, is advised. Semen parameters remain as the pilot in establishing the status of male fertility. Semen quality depends on many factors. Since several years researchers have been trying to find out probable causes for it by analysing semen in detail. Several studies revealed presence of different inorganic elements in semen (Skandhan, Abraham 1984; Skandhan et al.2009a;2011). We detected gold in it (Skandhan 1981).

Presence of gold in semen was supported by other studies also (Jain et al. 2010; Skandhan, Abraham 1984). Attempts were made to find out different aspects of it. It was present inside spermatozoa and outside in seminal plasma and detected more in normozoospermia (Skandhan et al.2010). Though in another study, we observed gold is more in oligo astehnozoospermia and azoospermia (Skandhan et al. 2016). In spermatozoa gold was present in head and tail (Skandhan et al.2009). The origin of gold in semen was identified as testis and caput epididymis (Skandhan et al.2009).It was also reported in male reproductive tract of animals like frog (Skandhan et al.1992;2019), rat and guinea pig (Skandhan et al.2015) .

The metal may not remain in semen as a waste product. The entry of this metal into the body and semen is not known. The classic Text of Ayurveda, the oldest Systematic Medical practice, present in India and few other Asian countries, says all substances present in soil are present in human body. The presence of gold in semen proves it (Skandhan 1981). The amount of gold present in soil vary from place to place. It may be expected to be more in the body nearer to any gold mine area and reverse in an area away from there. Similar picture may be expected in semen also. A study conducted nearer to a gold deposit area support this. (SahabKhan et al.2010). In this background the present study on gold in semen was initiated near and away from a gold mine and correlated to that of other parameters.

The study (Table 1) showed in samples of normozoospermia from non-gold mine area, the gold level was 0.243 ppm, whereas in gold mine area the value was much lower, 0.000765 (Table 1). This is not supporting the assumption that gold is likely to be more in normal semen of gold mine area. Though, here the fertility rate was shown much higher when compared to non-gold mine area (Prasad et al. 2011, Skandhan et al. 2010).

Probably SB leads to maintain increased sperm count and which also enters semen by which percentage of sperm motility increases. A study conducted in the infertile patient showed after the treatment with SB total sperm count and percentage of sperm motility reached at a higher level and maintained for a number of months (Skandhan et al. 2009b). In an experimental study, addition of "Suvarna Bhasma" (SB) (Gold ash), an Ayurvedic preparation, which is prescribed for infertile patients, increased the sperm motility (Skandhan et al.2017). Accepting gold as an essential element for fertility in male, Ayurveda Physicians prescribe "Suvarna Bhasma" (a preparation of gold leading to its ash).

Looking into results reported by different authors on gold in semen, its level is more in non-gold mine area than gold mine area (Table 1). Possibly an error in selection of method for gold estimation may not be excluded. The method opted in this study was ICP-MS (Table 1). This may not be a suitable method for estimation of gold. Our choice of method in case of non-gold mine area, both in normal semen as well as in clinical conditions was ICP-AES and gold was detected (Table 1 & 2). The results are compared with that of others (Table 1 & 2). It further supports that the method ICP-MS, is not a suitable method for gold estimation. Our earlier attempts with Direct Couple Plasma Emission Spectroscopy showed that this method was not a suitable one for estimation of gold in low level as in semen (Skandhan , Pandya 1986). Further supporting this , even the processing method prior to estimation is important. A comparative study on two processing methods prior to estimation of copper in seminal plasma showed highly significant difference in final value (Skandhan, 1986). All above placed references show the method(instrument) opted as well as the processing method adapted for this are important. It is likely, in the present study, our selection of instrument and the processing method were not suitable. Further study on similar line employing a different method for estimation of gold is proposed.

In conclusion, the study showed less amount of gold in semen of gold mine area in comparison to that of the non-gold mine are.

All authors read and approved the final version of the manuscript.

Authors have no conflict of Interest.

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