

Sex Offspring Ratio and Radiofrequency Radiation Exposure – A Comparison of High-Access Window Cleaners to Telecommunications Riggers

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Radiofrequency (RF) radiation is a silent and invisible hazard for both high-access window cleaners and telecommunications riggers that can heat body tissue, resulting in injury. In this study, a total of 68 high-access window cleaners were interviewed to establish their sex offspring ratio. Results indicated that there was no significant variance to that of the general Australian population.

The high-access window cleaning industry has a lower awareness of this hazard than the telecommunications industry. This study compares and contrasts its outcomes against a similar study within the telecommunications industry (n = 68), which also identified no significant variance.

As mobile telecommunication networks expand, the risk for high-access window cleaners will increase. Therefore, the study recommended that high-access window cleaning companies should revise their safety systems to ensure this hazard is addressed. A further recommendation was that this study should be repeated in the future to determine if expanding telecommunications networks and increased potential exposure has affected sex offspring ratios.

Introduction

There is widespread speculation in the telecommunications industry that telecommunications riggers have a higher frequency of females in their offspring due to RF radiation exposure [Ref. 1]. This belief is encouraged by the fact that telecommunications riggers climb towers and buildings to work on installations such as antennas and microwave dishes, and may be exposed to silent and unseen non-ionizing RF radiation. Furthermore, literature also exists to support the theory that RF radiation may affect the sex ratio of offspring [Ref. 2].

This study is a preliminary investigation into this area, where further studies will be based on measured field intensity data. Within this preliminary study, a total of 68 telecommunications riggers were interviewed to establish the sex ratios of their offspring.

The outcomes of this study were comparable to the sex offspring ratios found in the general Australian population [Ref. 1]. It is important to understand that, due to daily work with antennas, the telecommunications industry has a strong RF awareness.

In another study, the operations managers of 30 high-access window cleaning companies were interviewed and it was found that 15 (50 percent) had no awareness of the hazard [Ref. 3]. As not every building has mounted antennas, it is reasonable to conclude that this industry has a lower awareness of the hazard when compared to the telecommunications industry.

High-access window cleaners occasionally share worksites with telecommunications riggers; therefore, this study compares the sex offspring ratios of high-access window cleaners to those of telecommunications riggers. This study aims to correlate hazard awareness and any affected sex offspring ratios, and then to consider the relevance of any outcomes, noting the ever-expanding nature of the telecommunications industry.

Effects of RF (Non Reproductive)

Radiofrequency radiation (RF) may result in a number of health effects, such as cataracts, headaches, burns and a variety of thermal effects on the body [Ref. 4]. With the human body consisting of more than 70 percent water, RF radiation results in vibration of water molecules within the body, causing injury via a thermal effect. Laboratory studies suggest that adverse biological effects in tissue may be caused by temperature rises that exceed only 1°C above normal temperatures [Ref. 5]. It is important to note that the only generally accepted effect of non-ionizing radiation is thermal, but other effects may be postulated in different studies.

The lens of the human eye is highly sensitive to heat; hence, RF radiation may result in cataracts due to the poor ability of the eye lens to dissipate heat. In an Australian study, a group of radio- and TV-based maintenance technicians were compared with unexposed workers from the same geographic region. Cataracts were found to be in excess with the exposed workers.

It is notable, however, that solar radiation exposure is a known risk factor for cataracts and this was not considered in the study [Ref. 6].

Headache is often reported in the industry as a symptom of overexposure. In one study, a 31-year-old rigger claimed to have an accidental overexposure from a panel antenna when he worked within a sector after being told the power was isolated when it wasn't. He described a headache on the left side of his head, experienced as sharp pain [Ref. 7]. Within the industry, riggers carry RF monitors and are instructed — as a significant part of their RF awareness training — to always keep the monitor switched on — even if the telecommunications carrier advises that the sector is isolated.

In another Australian study, within a highly risk-controlled telecommunications environment, the relationship between RF radiation and headache was examined. That study concluded that headache was not common when a personal RF monitor alarmed (detecting an exposure). Once again, it was concluded that under strict risk-controlled conditions, the reporting of headache symptoms is not likely [Ref. 4].

Of course, there are a variety of confounding factors that may impact RF-related injury. These may include potential exposure to RF radiation-transmitting vectors, such as broadcast towers. The increased use of cell phones may also increase RF exposure, and there have been many studies aiming to identify a causal link between cell phone RF radiation exposure and cancer; however, the link is certainly not conclusive [Ref. 8]. This study focuses on the effects of RF radiation on sperm cells; males often carry their cell phones in their trouser pockets, putting their testes within proximity of their cell phone antennas' near field. This potential confounding factor will be considered in future studies.

Effects of RF (Reproductive)

It is evident that RF radiation can affect sperm count [Ref. 9]. RF radiation can also affect sperm motility and concentration. RF radiation may have a thermal effect on the body; hence, temperature increases may be responsible for reduced sperm quality [Ref. 10]. It is also apparent that RF radiation exposure may also have adverse reproductive effects [Ref. 1].

The sex ratio of offspring is an important indicator of a reproductive hazard [Ref. 2]. Studies within the military have demonstrated that exposure of males to RF radiation may result in a lower sex offspring ratio of males to females [Ref. 2]. Another study concluded that tactical pilots and astronauts who experienced high G forces had a significantly lower ratio of males to females in their offspring [Ref. 11].

One study found that there was a significant reduction in sperm motility in rats exposed to RF radiation as a result of oxidative stress. The study also identified changes to semen parameters, suggesting a causal relationship between changes in semen quality as a result of RF radiation exposure [Ref. 12].

The telecommunications industry employs riggers, who are often at risk of exposure to RF radiation. A previous study within a target population (n = 68) of telecommunications riggers demonstrated that their sex offspring ratio demonstrated little variance to the Australian general population. This study also highlighted that strict RF radiation awareness procedures and training existed within this population and, therefore, under such conditions, health effects are not likely [Ref. 1].

Human sperm cells hold either X and Y chromosomes and, for this reason, the male is responsible for determining the gender of offspring. There is a theory that male sperm (carrying a Y chromosome) are not as durable as female sperm (carrying an X chromosome). Male sperm are very motile at first before experiencing

Ratios of Female and Male Offspring (n=68)						
	No F	F	FF	FFF	FFFF	FFFFF
No M	12	6	3	2	0	0
M	6	18	3	2	0	0
MM	3	3	2	2	0	0
MMM	2	2	2	0	0	0
MMMM	0	0	0	0	0	0
MMMMM	0	0	0	0	0	0
Key: Female = F, Male = M						

Table 1 — Ratios of Female and Male Offspring (High-Access Window Cleaners).



“As the telecommunications industry continues to rapidly expand by mounting more antennas for improved range and reception quality, high-access window cleaners’ exposure to RF radiation will increase. Therefore, more research needs to be conducted within this area in the future.”

reduced motility and dying off quickly, whereas female sperm, by comparison, live longer [Ref. 13]. It may be the case that reduced sperm motility may impact the performance of male sperm, therefore increasing the probability of female offspring.

RF Awareness

Another Australian study within a highly risk-controlled telecommunications environment examined awareness of RF radiation within the near field of an antenna. Of the 59 riggers interviewed, 47 (79.66 percent) demonstrated an awareness of the hazardous nature of near and far antenna fields. This outcome reflects a good level of RF awareness within this population, characteristic of the telecommunications industry [Ref. 14]. There is minimal literature on the effects of RF radiation on high-access window cleaners. In one minor study, after interviewing 30 high-access window cleaning operations managers, it was noted that only 50 percent [Ref. 8] had an awareness of this hazard [Ref. 3]. This suggests that the high-access window cleaning industry may have a low awareness of this hazard.

In comparison to telecommunications riggers who work with antennas every day, high-access window cleaners only encounter antennas that happen to be mounted on certain buildings they climb. As the telecommunications industry continues to rapidly expand by mounting more antennas for improved range and reception quality, high-access window cleaners’ exposure to RF radiation will increase. As such, more research needs to be conducted within this area in the future.

Methods

Site visits were made to window cleaning operations and data was accumulated regarding sex offspring ratio from 68 high-access window cleaners. When gathering data on sex offspring ratio, the only condition was that the respondent must have been working within a

high-access window cleaning role at or shortly before the time of conception of their offspring — and after 1995, as mobile phone technology didn’t become prevalent until the early 1990s. Furthermore, all respondents must be male, as it is the X or Y chromosome carried by the sperm cell that determines the sex of the offspring.

Results

A total of 68 responses were compiled from high-access window cleaners throughout the company’s operation over a six-month period. All respondents approached agreed to be interviewed.

Findings and Discussion

Outcomes

The 68 high-access window cleaners interviewed during the six-month period had an even total of 67 male and 67 female offspring conceived at a time they were working in the field. This indicates that the sex offspring ratio identified demonstrated no significant variation ($p > 0.05$) from that of the Australian general population, which is 99.1 males to 100 females at birth [Ref. 15].

Previous studies in the telecommunications industry ($n = 68$) also identified that telecommunications riggers had a total of 72 males and 70 females as offspring conceived at a time they were working in the field. Therefore, this sex offspring ratio also identified no significant variance ($p > 0.05$) to that of the Australian general population [Ref. 3].

Awareness

High-access window cleaners have a lower awareness of the hazard of RF radiation in general [Ref. 3]. This is likely because high-access window cleaning is a traditional process and, although standards have evolved alongside the height safety aspect of the process, RF radiation awareness is still catching up.

In contrast, telecommunications riggers have strong industry-driven awareness of this hazard and associated antenna near fields [Ref. 14]. This is because mobile telecommunications-based rigging is a modern technology, and safety standards have closely evolved alongside this modern hazard, along with the height safety-related risks encountered by telecommunications riggers on a daily basis.

Conclusion

The reason there was no significant high-access window cleaner sex offspring ratio variance from the general Australian population is likely due to the lesser exposure levels in the past (when the mobile phone industry was in its early stages and not many buildings supported an-

tennas). It is interesting to note, however, that the telecommunications industry is forever expanding and more complex antenna arrays are being fixed and mounted on more buildings. It will be interesting to repeat such an analysis in five years. The outcomes in five years may depend on how aware the high-access window cleaning industry becomes of the potential hazard and the effectiveness of the risk controls it implements.

About the Author

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