

# Selected Lifestyle Factors of Candidate Sperm Donors and Their Effect on Spermogram Values in the Moravian Part of the Czech Republic. Study Protocol

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**INTRODUCTION:** Male infertility affects nearly 14% of men in Europe, and approximately 44% of them are unaware of the cause of their infertility. Thanks to the plentitude of research, we can now clearly define the risk factors that negatively affect semen quality, including substance abuse. The research objective seeks to determine whether these risk factors are present in candidate sperm donors in the clinics of reproductive medicine in the Moravian region and how they influence their spermogram (SPG) values.

**METHODS:** The lifestyle of candidate sperm donors will be monitored by a self-assessment questionnaire asking about dietary habits, physical activity, abusive behaviour including smoking habits, and alcohol and drug use. The SPG values will be evaluated according to the WHO manual from 2010. Moreover, the contents of potentially toxic elements in the seminal fluid will be determined using atomic absorption spectrometry.

**RESULTS:** Although the candidate sperm donors are young and healthy men aged 18–35, not everyone is classified as the normozoospermic, a prerequisite of acceptance into the donor program. **CONCLUSIONS:** The study will provide the specific profile of lifestyle habits, including abusive behaviour in candidate sperm donors. The results will be published in a peer-reviewed journal. We will be able to identify potential risk factors of lifestyle habits that negatively affect the quality of semen and thus increase the possibility of accepting young men into the donor programme.

**Keywords** | Lifestyle – Sperm Donor – Spermogram – Semen Quality – Male Fertility

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## 1 INTRODUCTION

Male fertility has emerged as a growing trend in discussions of human reproduction. Only 5–15% of normal semen quality among healthy young men was described over a decade ago (Sharpe, 2010), which points to a severe problem. Moreover, another study describes a relatively low recruitment rate of sperm donors (Liu et al., 2021). It has been acknowledged for many years that lifestyle factors can influence overall well-being, including reproductive health, in positive or negative ways (Ilacqua et al., 2018; Jurewicz et al., 2014; Sharma et al., 2013). Several factors, such as age of paternity, nutrients, physical activity, obesity, clothing, hot water soaking, mobile phones, psychological stress, smoking, and alcohol or drug use, among others (Godwin et al., 2013; Huang et al., 2021; Sharma et al., 2013), were described in relation to semen quality, which is essential for male fecundity. Although most studies describe a decline in semen quality, we can find studies where the changes are not detected (Huang et al., 2021).

Lifestyle habits are not the only factors influencing semen quality; environment (Pappalardo et al., 2023) or exposure to toxic elements such as heavy metals may influence the semen parameters as well. Metals contained in semen have a significant role in male fertility, and their levels play a crucial role in spermatogenesis (Rodríguez-Díaz et al., 2023). The primary source of exposure, as described by Wang et al. (2017), is the inhalation of polluted air or intake of contaminated food and water. Even smoking leads to the heavy metal accumulation in the human body; specifically, Cadmium could accumulate in the testicles and damage spermatogenesis in several ways (Pappalardo et al., 2023; Seren et al., 2002).

However, many studies (e.g., Gaur et al., 2010) concentrated on the consumption of cigarettes, alcohol, or drugs and their harmful effect on sperm parameters (Gaur et al., 2010; Jensen et al., 2014; Künzle et al., 2003). Cigarettes and reactive oxidation stress (ROS) significantly damage the structure of the sperm cells (Gaur et al., 2010; Sepaniak et al., 2006). Also, drug use of substances such as marijuana, heroin, and cocaine is hazardous not only for the human body in general but also for human reproduction (Alghobary & Mostafa, 2022). Although sperm donors should be healthy young men who do not use addictive substances, there is no evidence and control of such behaviour during the donation process.

A preventive programme focusing on reproductive health in young men is necessary for many of reasons. Young men who want to donate germ cells should have relevant information about modifiable lifestyle habits, which may increase the quality of semen samples and, thus, the probability of acceptance as sperm donors.

### 1.1 Objectives

The main objective of our research is to explore the potential effect of the lifestyle habits of candidate sperm donors on the quality of semen parameters, which are the primary predictor of male fertility. In addition, we will evaluate the association

between heavy metals in the seminal fluid of candidate sperm donors and their lifestyle habits. The study also looks at whether there are differences in semen parameters between both accepted and unaccepted sperm donor groups at the clinics of reproductive centres.

## 2 METHODS

### 2.1 Questionnaire construction

The first part of the research comprised the construction of the lifestyle questionnaire. The questionnaire is based on a previous literature review. It concentrates on specific lifestyle habits which were proven as harmful to semen quality in men (Benedetti et al., 2012; Fiala, 2008; Künzle et al., 2003; Sharma et al., 2013; Sharpe, 2010; Silver et al., 2005; Tvrdá et al., 2013). The questionnaire is divided into five subparts focusing on dietary habits, addictions, employment and leisure time activity, hygiene and sexual life, and general information. Questions on specific diseases of candidate sperm donors that could affect spermatogenesis (e.g., sexually transmitted and other infectious diseases or oncological diseases) are surveyed in the last mentioned part of the questionnaire. Sperm donors also have the opportunity to freely comment on any long-term illnesses for which they may be under treatment, including medications (for example, psychiatric or hormonal disorders). The questionnaire is composed of 63 questions. Although there is a prerequisite of healthy lifestyle habits in sperm donors, questions on tobacco, alcohol, and drugs were also surveyed.

### 2.2 Participants

Participants of this research were sperm donation candidates who visited the cooperating reproductive centres in the Moravian part of the Czech Republic. In the Czech Republic, the conditions for sperm donation are specified in Act. No. 373/2011 Coll. On specific health services. The age range suitable for donation is set to be between 18 and 40 years. In total, 206 candidate sperm donors visited the reproductive medical centres. Seven participants were excluded because of an incomplete questionnaire or incomplete spermogram. Eventually, the sample will contain 199 participants included in the statistical analysis.

### 2.3 Semen analysis

Participants provided semen samples obtained by masturbation, ensuring the intimacy and anonymity of the donor at clinics of reproductive medicine. The donated specimen was collected into a standard sterile plastic container and evaluated macroscopically and microscopically per WHO manual (World Health Organization, 2010). All participating laboratories complied with accreditation standard ČSN EN ISO 15189:2013. A part of semen samples (around 0.5ml) was pipetted into a microtube and frozen to a temperature of -20°C after evaluating semen parameters. These samples were transported for chemical analysis in a frozen state.

In the laboratories of the Department of Public Health at Masaryk University, the contents of both essential and toxic elements known to impact male reproductive function (Ca, Cd, Cu, Mg, Mn, Ni, and Zn) were determined. The samples were acid-digested, and the elemental content was analysed using atomic absorption spectrometry with flame and graphite furnace atomization.

## 2.4 Data collection

The data collection was carried out from 2015 to 2021. This long period was mainly caused by the Covid-19 pandemic, since during the years 2019 and 2020 there was zero evidence of new candidate sperm donors at cooperating clinics of reproductive medicine. All candidate sperm donors completed the self-reported questionnaire and submitted it with the semen sample anonymously during the organizational process. Questionnaires and specimens were paired with the same code to ensure anonymity and relevant analysis.

## 2.5 Data analysis

The data obtained from the questionnaire will be prepared for statistical analysis. Additionally, potential differences in the elemental composition of sperm between the groups with normal and abnormal sperm parameters will be assessed. Primarily, nonparametric tests, such as the Mann-Whitney U test, will be employed.

## 2.6 Ethics

The ethical aspects of the study are assured by the design of the study itself; gamete donation is an anonymous process prescribed by law. A study proposal was submitted to the Ethical Committee of the Atlas Hospital in Zlín in on February 20, 2015 and has been approved on May 15, 2015. The participants were verbally informed that by completing a questionnaire they agreed to the processing of the sample for scientific purposes. The whole process is anonymised and the identification of the donors is not possible.

## 3 DISCUSSION

### 3.1 Strengths and limitations

Although there is broad evidence of manuscripts describing lifestyle habits of people in the Czech Republic and statistical data concentrated on health status and reproduction health, the evidence of lifestyle habits of sperm donors is pure. In accordance with the aim of the study, we will assess the potential risk lifestyle habits of candidate sperm donors on the sperm parameters, and we will identify the potential risks which may influence acceptance into the sperm donation programme.

As a limitation of this study, we find the self-reported questionnaire to ensure the donor anonymity and to obtain detailed lifestyle information. The participants may have misrepresented information about their habits to describe themselves in a better way. A specific limitation of the study could be the amount of semen specimens exposed to chemical analysis.

In this study, we do not concentrate on men's motivation for donation. However, education of potential sperm donors about healthy lifestyle habits and their possible lifestyle modification may increase the probability of acceptance into the donor programme. More research to extend the information about sperm donors from different perspectives is needed.

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**Authors' contributions:** DP designed the study and proposed the study design. The author designed the initial form of the article and conducted the literature review. JŠ supervised the study design and participated in the article preparation. OZ designed the chemical analysis of semen samples, participated in the article preparation and supervised the discussion part of related work. All authors contributed to the creation of the article and approved the final version of the manuscript.

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## REFERENCES

- Act. No., 373/2011 On specific health services (2011). *Zákony pro lidi*. <https://www.zakonyprolidi.cz/cs/2011-373>
- Alghobary, M., & Mostafa, T. (2022). Addiction and human male fertility: A systematic review and a critical appraisal. *Andrology*, *10*(6), 1073–1095. <https://doi.org/10.1111/andr.13196>
- Benedetti, S., Tagliamonte, M. C., Catalani, S., Primiterra, M., Canestrari, F., De Stefani, S., Palini, S., & Bulletti, C. (2012). Differences in blood and semen oxidative status in fertile and infertile men, and their relationship with sperm quality. *Reproductive Biomedicine Online*, *25*(3), 300–306. <https://doi.org/10.1016/j.rbmo.2012.05.011>
- Fiala, J. (2008). Simple nutrition software for quick assessment and the results of its distribution to members of the public. *Hygiene*, *53*(1), 12–18.
- Gaur, D. S., Talekar, M. S., & Pathak, V. P. (2010). Alcohol intake and cigarette smoking: Impact of two major lifestyle factors on male fertility. *Indian Journal of Pathology and Microbiology*, *53*(1), 35. <https://doi.org/10.4103/0377-4929.59180>
- Godwin, M., Pike, A., Bethune, C., Kirby, A., & Pike, A. (2013). Concurrent and convergent validity of the simple lifestyle indicator questionnaire. *ISRN Family Medicine*, *2013*, Article 529645. <https://doi.org/10.5402/2013/529645>
- Huang, C., Liu, Q., Wang, Z.-W., Zhou, W.-J., Huang, Z.-H., Ji, X.-R., Luo, X.-F., Tang, Y.-L., Fan, L.-Q., & Zhu, W.-B. (2021). Sperm donor lifestyle survey: Modifiable risk factors for potential sperm donors. *Journal of Assisted Reproduction and Genetics*, *38*(11), 2965–2974. <https://doi.org/10.1007/s10815-021-02322-x>
- Ilacqua, A., Izzo, G., Emerenziani, G. P., Baldari, C., & Aversa, A. (2018). Lifestyle and fertility: The influence of stress and quality of life on male fertility. *Reproductive Biology and Endocrinology*, *16*(1), 115. <https://doi.org/10.1186/s12958-018-0436-9>
- Jensen, T. K., Swan, S., Jørgensen, N., Toppari, J., Redmon, B., Punab, M., Drobnis, E. Z., Haugen, T. B., Zilaitiene, B., Sparks, A. E., Irvine, D. S., Wang, C., Jouannet, P., Brazil, C., Paasch, U., Salzbrunn, A., Skakkebaek, N. E., & Andersson, A.-M. (2014). Alcohol and male reproductive health: A cross-sectional study of 8344 healthy men from Europe and the USA. *Human Reproduction*, *29*(8), 1801–1809. <https://doi.org/10.1093/humrep/deu118>
- Jurewicz, J., Radwan, M., Sobala, W., Ligocka, D., Radwan, P., Bochenek, M., & Hanke, W. (2014). Lifestyle and semen quality: Role of modifiable risk factors. *Systems Biology in Reproductive Medicine*, *60*(1), 43–51. <https://doi.org/10.3109/19396368.2013.840687>
- Künzle, R., Mueller, M. D., Hänggi, W., Birkhäuser, M. H., Drescher, H., & Bersinger, N. A. (2003). Semen quality of male smokers and nonsmokers in infertile couples. *Fertility and Sterility*, *79*(2), 287–291. [https://doi.org/10.1016/S0015-0282\(02\)04664-2](https://doi.org/10.1016/S0015-0282(02)04664-2)
- Liu, J., Dai, Y., Li, Y., Yuan, E., Wang, Q., Guan, Y., & Lou, H. (2021). Analysis of the screening results of 24040 potential sperm donors in a human sperm bank in Henan Province, China: A 14-year retrospective cohort study. *Human Reproduction*, *36*(5), 1205–1212. <https://doi.org/10.1093/humrep/deab028>
- Pappalardo, C., Cosci, I., Moro, G., Stortini, A. M., Sandon, A., De Angelis, C., Galdiero, G., Trifuoggi, M., Pivonello, R., Pedrucci, F., Di Nisio, A., Foresta, C., Ferlin, A., & De Toni, L. (2023). Seminal cadmium affects human sperm motility through stable binding to the cell membrane. *Frontiers in Cell and Developmental Biology*, *11*, Article 1134304. <https://doi.org/10.3389/fcell.2023.1134304>
- Rodríguez-Díaz, R., Blanes-Zamora, R., Vaca-Sánchez, R., Gómez-Rodríguez, J., Hardisson, A., González-Weller, D., Gutiérrez, Á. J., Paz, S., Rubio, C., & González-Dávila, E. (2023). Influence of seminal metals on assisted reproduction outcome. *Biological Trace Element Research*, *201*(3), 1120–1134. <https://doi.org/10.1007/s12011-022-03256-w>
- Sepaniak, S., Forges, T., Gerard, H., Foliguet, B., Bene, M.-C., & Monnier-Barbarino, P. (2006). The influence of cigarette smoking on human sperm quality and DNA fragmentation. *Toxicology*, *223*(1–2), 54–60. <https://doi.org/10.1016/j.tox.2006.03.001>
- Seren, G., Kaplan, M., & Ibar, H. (2002). A comparative study of human seminal plasma and blood serum trace elements in fertile and infertile men. *Analytical Letters*, *35*(11), 1785–1794. <https://doi.org/10.1081/AL-120013583>
- Sharma, R., Biedenharn, K. R., Fedor, J. M., & Agarwal, A. (2013). Lifestyle factors and reproductive health: Taking control of your fertility. *Reproductive Biology and Endocrinology*, *11*, 66. <https://doi.org/10.1186/1477-7827-11-66>
- Sharpe, R. M. (2010). Environmental/lifestyle effects on spermatogenesis. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *365*(1546), 1697–1712. <https://doi.org/10.1098/rstb.2009.0206>
- Silver, E. W., Eskenazi, B., Evenson, D. P., Block, G., Young, S., & Wyrobek, A. J. (2005). Effect of antioxidant intake on sperm chromatin stability in healthy nonsmoking men. *Journal of Andrology*, *26*(4), 550–556. <https://doi.org/10.2164/jandrol.04165>
- Tvrđá, E., Sikeli, P., Lukáčová, J., Massányi, P., & Lukáč, N. (2013). Mineral nutrients and male fertility. *Journal of Microbiology, Biotechnology and Food Sciences*, *3*(1), Article 1.
- Wang, Y.-X., Wang, P., Feng, W., Liu, C., Yang, P., Chen, Y.-J., Sun, L., Sun, Y., Yue, J., Gu, L.-J., Zeng, Q., & Lu, W.-Q. (2017). Relationships between seminal plasma metals/metalloids and semen quality, sperm apoptosis and DNA integrity. *Environmental Pollution*, *224*, 224–234. <https://doi.org/10.1016/j.envpol.2017.01.083>
- World Health Organization. (2010). WHO laboratory manual for the examination and processing of human semen (5th edition). <https://apps.who.int/iris/handle/10665/44261>