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PHARMAKEFTIKI, 37, 2S, 2025 | 379-383 RESEARCH

https://doi.org/10.60988/p.v37i2S.235

The effects of *Stevia rebaudiana* consumption on male reproductive parameters: a cross-sectional study

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KEY WORDS:
fertility; male reproductive system; semen; stevia; testosterone

ARTICLE INFO:
Received: January 31, 2025
Revised: February 14, 2025
Accepted: February 19, 2025
Available online: October 10, 2025

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ABSTRACT

Stevia, a natural sweetener deriving from the leaves of the plant *Stevia rebaudiana*, has gained widespread popularity as a sugar substitute. This study aimed at evaluating the effects of stevia consumption on male reproductive parameters, with particular emphasis on serum testosterone concentration and sperm count. A cross-sectional study was conducted in Samawah City, Iraq, between February 2023 and April 2024, involving 80 male participants. Subjects were categorized into two groups: a stevia-treated group (N=40), which consumed stevia as a dietary sugar substitute, and a control group (N=40), which maintained their habitual dietary intake. Serum testosterone levels (μg/L) and semen samples were analysed in order to assess reproductive parameters, including sperm count ($\times 10^6$/mL), sperm motility (%), and sperm morphology. The mean age of participants did not differ significantly between the control group (33.65 ± 7.16 years) and the stevia-treated group (35.95 ± 5.72 years). Stevia consumption had no statistically significant effect on serum testosterone levels, with mean values of 21.10 ± 11.84 μg/L in the control group and 20.03 ± 10.84 μg/L in the stevia-treated group. Although a non-significant increase in sperm morphological abnormalities was observed in the stevia-treated group, sperm motility remained unaffected. Notably, a statistically significant reduction in sperm count was detected in the ste-

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via-treated group (18.03 ± 8.938 $\times 10^6$/mL) compared to controls. In conclusion, dietary stevia intake did not alter serum testosterone levels or sperm motility. However, it was associated with a significant decrease in sperm count and a slight, non-significant increase in sperm deformities.

1. Introduction

Stevia is a natural sweetener extracted from the leaves of *Stevia rebaudiana*. It has gained popularity as an alternative to conventional sweeteners, primarily due to its potential to reduce caloric and sugar intake. As a plant-derived product, stevia appeals to individuals seeking a more natural dietary option. It is widely incorporated into various food and beverage products, including confectionery and soft drinks[1]. In addition to its sweetening properties, stevia has been investigated for potential health benefits, particularly its role in blood glucose regulation and weight management.

The US Food and Drug Administration (FDA) and the European Food Safety Authority (EFSA) generally consider stevia-derived compounds to be safe when consumed within recommended limits. However, as of January 2022, studies examining the effects of stevia on male fertility remain limited and inconclusive. Some animal studies have reported that high doses of steviol (a bioactive compound found in stevia) may negatively affect male reproductive parameters, including sperm count and motility[2]. It is important to note that such studies often utilize doses far exceeding those typically consumed through regular dietary intake.

This study aimed at investigating the potential impact of stevia consumption on male reproductive health. Specifically, it has evaluated serum testosterone concentration, sperm morphology (deformities), sperm motility, and sperm count in individuals who regularly consumed stevia as a sweetener, compared to a control group with no stevia intake.

2. Methodology

This cross-sectional study was conducted in Samawah City, Iraq, between February 2023 and April 2024. Ethical approval was obtained from the Ethical Research Committee at the College of Dentistry, Al-Iraqia University (HAS & HER 08-05-07-2024). All participants provided written informed consent. Study procedures were carried out at the Al-Hussein Teaching Hospital in Samawah City and at the Kamal Alsamarai Specialized Infertility Hospital in Baghdad City, Iraq.

A total of 80 male participants, aged 18–45 years, were enrolled. Subjects were divided into two groups: the control group comprised healthy individuals who did not consume stevia or any other low-calorie sweetener (e.g., saccharin), while the stevia-treated group included individuals who had consumed stevia products as a sweetener for more than three months. Exclusion criteria included a history of infertility, diabetes mellitus, current medication use, abnormal body mass index (BMI<18.5 or >24.9), smoking, alcohol consumption, or other lifestyle factors known to affect serum testosterone levels or semen quality.

Semen and serum samples were collected from all participants. Serum testosterone levels were measured using the Cobas e 411 immunoassay analyser (Roche Diagnostics International Ltd., Germany), based on the competitive binding principle. Semen samples were visually assessed by an experienced operator for colour, density, and general appearance. Microscopic and physical evaluations of sperm were performed using an automated sperm analyser (SCA Scope, Spain).

Statistical analyses were conducted using Micro-

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Table 1. Statistical comparison of control and stevia-treated groups with respect to age, serum testosterone levels, sperm deformity rate, sperm motility, and sperm count.

Variable	Group	N	Mean ± SD	*p*-value
Age (years)	control	40	33.65 ± 7.16	0.1167
	stevia-treated	40	35.95 ± 5.72	
Serum testosterone levels (μg/L)	control	40	21.10 ± 11.84	0.6745
	stevia-treated	40	20.03 ± 10.84	
Rate of deformities (%)	control	40	14.12 ± 8.06	0.2810
	stevia-treated	40	16.22 ± 9.23	
Sperm motility (%)	control	40	37.19 ± 16.36	0.3321
	stevia-treated	40	33.44 ± 17.93	
Sperm count ($\times 10^6$/mL)	control	40	23.25 ± 9.02	0.0111
	stevia-treated	40	18.03 ± 8.94	

soft Excel 2020 and GraphPad Prism (version 16). Data normality was assessed using the Shapiro–Wilk test. Parametric analyses were performed using independent *t*-tests and analysis of variance (ANOVA), with a p-value <0.05 considered as statistically significant.

3. Results and Discussion

As shown in Table 1, there was no statistically significant difference in age between the control and the stevia-treated groups. This finding is critical for interpreting the study outcomes, as age is known to influence several reproductive parameters, including serum testosterone concentration, sperm count, and motility[3]. The absence of age-related variation enhances the internal validity and reproducibility of the study.

Testosterone levels, as also presented in Table 1, did not differ significantly between the two groups. Although a slight reduction was observed in the stevia-treated group, this change was not statistically significant and likely falls within the range of normal physiological variation. Factors such as the duration of stevia intake, the dosage, and the individual variability may contribute to this outcome[4]. Importantly, serum testosterone concentrations in both groups remained within the normal reference range for adult males, and no clinically meaningful reduction was observed in the stevia-treated group.

Sperm morphology analysis revealed a non-significant difference in the rate of deformities between the groups (Table 1). Although the stevia-treated group exhibited a numerically higher rate of morphological abnormalities, this variation was not statistically significant and remained within the normal range. Sperm morphology is a key parameter in assessing male fertility, and alterations may have reproductive implications. However, within the context of this study, stevia consumption did not appear to affect sperm morphology in a clinically significant manner. These findings provide preliminary evidence that short-term stevia intake does not increase sperm deformities[5]. Further research with larger sample sizes and longer exposure durations is warranted in order to explore potential long-term effects.

Sperm motility, another critical determinant of male reproductive potential, showed no statistically significant difference between the control and the stevia-treated groups (Table 1). Both groups maintained motility values within the normal range. Sperm motility can be influenced by numerous factors, including lifestyle habits, environmental exposures, and general health status[6]. The absence of significant variation suggests that stevia consumption does not impair sperm motility under the conditions studied.

Sperm count (sperm concentration), a fundamental indicator of male fertility, demonstrated a statistically significant reduction in the stevia-treated

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group compared to controls (Table 1). Despite this reduction, the mean sperm count in the stevia group remained within the reference range for healthy males. This finding warrants cautious interpretation, as sperm production is a dynamic process subject to short-term fluctuations. Although many confounding factors were excluded during data collection, residual influences such as environmental exposures and dietary habits may still play a role[7]. Longitudinal studies are needed in order to determine whether the observed reduction in sperm count is transient or persistent. Given that sperm motility and morphology were unaffected, the clinical relevance of the reduced sperm count remains uncertain.

4. Conclusion

This study exhibited no significant difference in age between the control and stevia-treated groups, thereby reinforcing the reliability of the comparative analysis. Serum testosterone levels and sperm motility were not significantly affected by stevia consumption, and although a slight increase in sperm morphological abnormalities was observed in the stevia-treated group, this change was not statistically significant. In contrast, a significant reduction in sperm count was detected in the stevia-treated group, though values remained within the normal range. These findings suggest that while stevia consumption may influence sperm concentration, its short-term use does not appear to impair other key reproductive parameters.

Acknowledgements

The authors extend their gratitude to the Kamal Alsamarai Specialized Infertility Hospital, Baghdad, Iraq, for providing the facilities and support necessary to conduct this study.

Conflicts of interest

None exist.

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References

1. Ali A.M., Hussein N.A., Jawad D., Abed H.H., Mekkey S.M. Hepatotoxic effects of *Stevia rebaudiana* leaf extract and commercial stevia on rats: a comparative study. *Rev. Clin. Pharmacol. Pharmacokinet. Int. Ed.* 38(s2), 69–72, 2024. DOI: 10.61873/XFAQ5379
2. Watanabe T., Fujikawa K., Urai S., Iwaki K., Hirai T., Miyagawa K., *et al.* Identification, chemical synthesis, and sweetness evaluation of rhamnose or xylose containing steviol glycosides of stevia (*Stevia rebaudiana*) leaves. *J. Agric. Food Chem.* 71(29), 11158–11169, 2023. DOI: 10.1021/acs.jafc.3c01753
3. Demirkol M.K., Barut O., Dogan N.T., Hamarat M.B., Resim S. At what age threshold does the decline in semen parameters begin? *J. Coll. Physicians Surg. Pak.* 31(1), 4–7, 2021. DOI: 10.29271/jcpsp.2021.01.4
4. Villaño D., Masoodi H., Marhuenda J., García-Viguera C., Zafrilla P. Stevia, sucralose and sucrose added to a maqui-*Citrus* beverage and their effects on glycemic response in overweight subjects: a randomized clinical trial. *LWT* 144, 111173, 2021. DOI: 10.1016/j.lwt.2021.111173
5. Shankar P., Ahuja S., Sriram K. Non-nutritive sweeteners: review and update. *Nutrition* 29(11–12), 1293–1299, 2013. DOI: 10.1016/j.nut.2013.03.024
6. Durairajanayagam D. Lifestyle causes of male infertility. *Arab. J. Urol.* 16(1), 10–20, 2018. DOI:

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10.1016/j.aju.2017.12.004
7. Sharma R., Biedenharn K.R., Fedor J.M., Agarwal A. Lifestyle factors and reproductive health: taking control of your fertility. *Reprod. Biol. Endocrinol.* 11, 66, 2013. DOI: 10.1186/1477-7827-11-66

HOW TO CITE:
Oliwi A.A., Al-Hamdani H.A., Khalifa A.Y., Abed H.H., Hussein T.A., Al Salihi K.A. The effects of *Stevia rebaudiana* consumption on male reproductive parameters: a cross-sectional study. *Pharmakeftiki* 37(2s), 379-383, 2025. https://doi.org/10.60988/p.v37i2S.235