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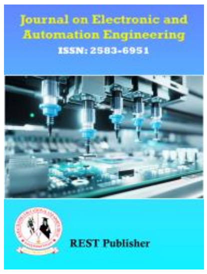

Environmental Factors that Lead to High Infertility Rates using COPRAS method

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***Abstract**: Rising infertility rates have emerged as a serious global health issue driven by a complex interplay of environmental, biological, and socioeconomic factors. There is growing evidence that environmental conditions play a significant role in influencing reproductive health outcomes. This study explores a wide range of environmental factors associated with infertility, including endocrine-disrupting chemicals, air and water pollution, altered lifestyle patterns, dietary habits, stress, and disparities in healthcare access. Both physical and chemical environmental stressors are considered, highlighting their cumulative and interconnected effects on human fertility. Understanding these environmental impacts is crucial for developing effective interventions aimed at reducing infertility and improving reproductive health at both individual and population levels. Infertility not only affects physical health but also has significant psychological, emotional, and social consequences for individuals and couples, underscoring the need for holistic and preventive approaches. Furthermore, exploring the relationship between environmental factors and infertility supports global public health priorities and aligns with the United Nations Sustainable Development Goals, particularly those focusing on health, well-being, and sustainable development. To systematically assess the impact of environmental factors, the COPRAS-G (Complex Proportional Assessment with Gray relations) decision-making method is employed. This approach helps in identifying key evaluation criteria, assessing alternatives under conflicting conditions, and determining overall performance. Five alternatives – Country A, Country B, Country C, Country D, and Country E – are evaluated based on pollution levels, stress levels, healthcare access, and dietary quality. Country A achieves the highest ranking, indicating the most favorable conditions for reproductive health, while Country C ranks the lowest. The findings emphasize the importance of environmental policies, regulatory frameworks, and targeted public health strategies in mitigating infertility risks and safeguarding reproductive well-being.*

***Keywords:** Micro biome; Human micro biome; Human reproduction; Female reproductive system; Female infertility*

1. INTRODUCTION

Environmental factors can play a significant role in increasing the likelihood of male infertility. Male infertility, which refers to a man's inability to impregnate a fertile female partner, can be influenced by environmental factors as much as genetic and medical causes. These environmental elements have the potential to interfere with proper reproduction, leading to reduced sperm quality, count, and motility. Here are some key environmental factors and their impact on male infertility: Endocrine Disrupting Substances: Endocrine disruptors encompass a range of substances found in the environment, including pesticides, phthalates, and biphenyl A (BPA). These compounds can mimic or interfere with hormones in the body, particularly those related to reproduction. Exposure to endocrine disruptors can lead to hormonal imbalances that negatively affect sperm production and function. Chemical and Toxin Exposure: Exposure to various chemicals and toxins, such as heavy metals (lead, cadmium, mercury), industrial chemicals, and pollution, can harm sperm production, motility, and morphology. Prolonged exposure to these substances can accumulate in the body and result in oxidative stress, DNA damage to sperm cells, and disruptions in the reproductive system. Heat and Radiation: Extended exposure to high temperatures, such as in hot tubs or saunas, as well as radiation from devices like mobile phones, laptops, and certain occupations, can elevate the temperature of the scrotum. Elevated scrotal temperatures can negatively impact the quantity and quality of sperm. Lifestyle Choices: Unhealthy lifestyle behaviors like smoking, excessive alcohol consumption, and recreational drug use can significantly affect male fertility. Smoking introduces harmful chemicals to the body that can damage sperm DNA, decrease sperm counts, and impair sperm motility. Similarly, excessive alcohol intake can lead to hormonal disruptions and reduced sperm production. It's important to note that these environmental factors, alongside genetic and medical factors, contribute to the overall landscape of male infertility. Understanding and mitigating these influences can be crucial for couples facing difficulties with conception [1] Our overall health is significantly influenced by our daily routines and other aspects of our way of life. These lifestyle choices are largely influenced by our personal preferences and the immediate social environment we're in. Our continuous interaction with our surroundings affects not only our physical state but also takes into account lifestyle considerations. These factors typically affect the neuroendocrine pathways, causing disruptions in metabolism. This article seeks to explore the potential links between different neuroendocrine pathways, lifestyle, and environmental elements. It also discusses the potential repercussions of these connections on female physiology and the potential impairment of reproductive capacity [2] various cultural, environmental, and economic factors play a significant role in influencing fertility, particularly in less developed nations where diseases and poverty are widespread. In underdeveloped regions like Africa, infertility is primarily attributed to environmental factors. The prevalence of infertility and childlessness in sub-Saharan Africa stands out as a notable health concern for the area. The introduction of new well-funded policies has yielded observable improvements in the region's reproductive health landscape [3]. The local microbiota in this area has played a significant role in maintaining a state of good health. Consequently, alterations caused by either internal or external triggers can lead to an imbalance in microbial composition, potentially leading to the development of diseases. could be due to challenges related to working with a low-density microbial environment in the uterus. The microbial community in the female reproductive system plays a vital part in both human reproduction and women's overall well-being, a subject we will explore further in this article. [4] When a clinical pregnancy cannot be achieved following 12 months of consistent and unprotected sexual activity, it is termed as infertility. Globally, an estimated 8 to 12% of couples in their reproductive years are believed to experience this condition. Among cases of infertility, 20-30% are attributed solely to male factors, yet males are involved in half of all instances. Secondary infertility, primarily triggered by reproductive infections, is the most common form of female infertility worldwide. Additional factors such as consanguinity, exposure to endocrine-disrupting substances, and observed declines in semen quality over time can also contribute to fertility issues. [5] Environmental factors play a significant role in contributing to the problem of infertility. Lifestyle choices influenced by the environment also play a role in this scenario. Factors such as stress, physical activity, and diet can all impact fertility. A diet lacking essential nutrients can influence the production of reproductive hormones and the quality of eggs. Meanwhile, a sedentary lifestyle and high stress levels can disturb menstrual regularity and hormone balance [6]. Various physiological factors that impact a woman's ability to conceive and carry a pregnancy might lead to female infertility. Among these factors, issues related to the ovaries, fallopian tubes, uterus, and cervix can play a significant role. Here is a list of common physiological causes and their respective treatments: Fallopian Tube Blockage or Damage: Lifestyle Factors: Other lifestyle factors, such as smoking, excessive alcohol consumption, and obesity, can affect fertility in both men and women.[7] Smoking is known to reduce fertility in women by accelerating the loss of eggs and causing damage to the reproductive organs. In men, smoking can lead to lower sperm counts and motility. Obesity can disrupt hormonal balance in both genders. In women, it can lead to irregular menstrual cycles and ovulation issues, while in men, it can affect testosterone levels and sperm quality [8] infertility has primarily been associated with women. However, it's important to note that approximately one in every three instances of infertility is attributed solely to male factors. Confronting a diagnosis of male infertility can pose as an extremely daunting obstacle for men. Sperm, the reproductive cells, are manufactured within the testicles and subsequently housed within a lengthy system of ducts known as the epididymis, situated atop each testicle. These sperm are sustained by semen, a fluid generated by various glands along their path. In this context, Nan robots play a role in artificially enhancing sperm mobility to facilitate their journey toward an egg cell [9]. Treating male infertility involves various strategies and approaches aimed at addressing the underlying causes of the fertility issues in men. It's important to note that the specific treatment approach depends on the underlying factors contributing to infertility. Medical Treatments: Depending on the underlying cause of infertility, medical treatments may be prescribed. For example, hormonal imbalances can be corrected through hormone replacement therapies. Antibiotics might be used to treat infections that affect sperm production and quality. Surgery: Surgical procedures might be recommended to correct physical abnormalities that affect fertility. For instance, varicocele repair involves fixing dilated veins in the scrotum that can negatively impact sperm production [10] Environmental factors encompass various external elements that can significantly impact maternal health outcomes during pregnancy, childbirth, and the postpartum period. Pollutants can contribute to respiratory problems, preterm birth, and other adverse outcomes [11] the influence of lifestyle and environmental elements on male infertility is a significant concern in reproductive health. These factors can have a substantial impact on male reproductive function, leading to difficulties in conceiving. Obesity: Excess body weight is linked to hormonal imbalances, particularly a rise in estrogen levels, which can hamper sperm production. Additionally, obesity is associated with inflammation and insulin resistance, further impacting reproductive function. Smoking and Alcohol: Both smoking and excessive alcohol consumption can negatively impact sperm count, motility, and morphology. They contribute to oxidative stress, DNA damage, and hormonal disruptions, which collectively diminish fertility potential. [12] Assisted reproductive techniques encompass a range of medical interventions designed to aid couples facing challenges with conception. These techniques, which include in vitro fertilization (IVF) and intracytoplasmic sperm injection (ICSI), involve complex procedures that can potentially expose both gametes (sperm and eggs) and embryos to various stressors. Antioxidants are compounds that help counteract the harmful effects of oxidative stress. They work by neutralizing ROS, thus minimizing potential damage to cellular structures and genetic material. In the context of ART, providing an optimal environment for gametes and embryos is crucial, and antioxidants seem to contribute to this goal. Various studies have explored the impact of antioxidant supplementation on the outcomes of ART procedures. Research suggests that incorporating antioxidants into the treatment regimen may lead to improved sperm quality, reduced DNA damage, and enhanced embryo development. This, in turn, could potentially translate to higher pregnancy rates and healthier offspring [13].

2. MATERIALS AND METHOD

Pollution Level: Pollution refers to the presence or introduction of harmful substances or contaminants into the environment, such as air, water, or soil. This can result in negative effects on the natural ecosystem, human health, and overall well-being. Pollution can take various forms, including air pollution from industrial emissions, water pollution from chemical waste, and soil pollution from improper disposal of hazardous materials.

Stress Level: "Stress level" refers to the amount or degree of psychological and emotional pressure or tension that an individual is experiencing at a particular moment. It indicates how much stress a person is undergoing, which can be influenced by various factors such as work, personal relationships, health, and other life circumstances.

Healthcare Access: Healthcare access pertains to the ability of individuals to obtain and utilize healthcare services, including medical treatment, preventive care, and health-related resources. It encompasses the availability, affordability, and geographic proximity of healthcare facilities and services that allow people to maintain and improve their health. Adequate healthcare access ensures that individuals can receive timely and appropriate medical attention, regardless of their socioeconomic status, location, or other barriers. It involves addressing disparities in healthcare availability and ensuring that all members of a community have the opportunity to achieve optimal health outcomes.

Diet Quality: "Diet quality" refers to the overall nutritional value and composition of the foods and beverages that a person consumes. It assesses the healthiness of a diet based on factors such as the variety of foods, their nutrient content, and their contribution to meeting dietary recommendations. A diet with high quality is typically rich in essential nutrients, low in excessive sugar, salt, and unhealthy fats, and aligned with dietary guidelines for promoting good health and preventing chronic diseases.

Method: COPRAS (Complex Proportionality Assessment) is one of the most used Multi-Criteria Decision Making (MCTM) methods, and the ratio of the best solution Determining the solution with the best rate in the set of possible alternatives by Provides a better alternative Bad Solution This technique has Decision making problems Various to solve used by researchers [14].The COPRAS-G method requires identifying selection criteria; evaluating information related to these criteria, and developing methods to evaluate Meeting the participant's needs Criteria for doing in order to assess the overall performance of the surrogate. Decision analysis involves a Decision Maker (DM) Situation to do consider a particular set of alternatives and select one among several alternatives, usually with conflicting criteria. For this reason, the developed complexity proportionality assessment (COPRAS) method can be used [15]. In 1996 in Lithuania COPRAS (Complex Proportion evaluation) method was developed. Construction, economics, real estate and management. One of the articles assesses the risks involved in construction projects. The assessment is based on various multi-objective assessment methods. The risk assessment indices are selected considering the interests, objectives and factors of the countries that influence the construction efficiency and real estate price increase [16] to describe and consider the task model. Complex Proportionality Assessment (COPRAS) Method Similar to any many other criteria will make the decision (MCDM) tool, first Proposed COBRAS method of several related criteria basically for alternatives Used to prioritize criterion weights. This method is better and Worst-Best Solutions Best decision considering Selecting alternatives [17]. Cobras approach is used for device tool choice; Because of this the triangle Ambiguous numbers are selected their computational performance. Three area specialists are selected to assign weights and by way of combining the fuzzy cobra's method, System 1 (MC1) and device 2(MC2) similarly are ranked, with way of ma chine three and four. -based totally approach is utilized in mixture with fuzzy. COPRAS assess the complexity of consumer dating management (CRM) performance. A combined choice matrix is obtained from a panel of 20 specialists offered 3 options with set, and 5 criteria Assessment are done [18]. COPRAS to resolve MCDM issues, wherein the weights of the criteria and Performance ratings of alternatives are absolute Based on linguistic terms are calculated. Comparison of criteria Importance calculated and Cobras method become used to assess renovation strategies [19]. This has a look at ambitions to develop the impact of latest overall performance metrics in TPM and COPRAS in an ambiguous context Primarily multi-criteria selection based on opinions Use the do method. Looseness of paper is prepared as follows [20]. Complex proportional estimation approach with gray c language

Numbers (COPRAS-G) approach. Cobras- G's idea approach is based on standards values expressed in durations, actual decision-making conditions, and programs of Gray Systems Theory. Diploma [21]. COPRAS method changed into the most relevant social media platform Rank and choose is used. Proposed Applicability of the structure We proved and proved the character [22].COPRAS (Complex Proportionality Assessment) To examine Cumulative of an alternative Performance, it is essential become aware of the maximum vital criteria, examine the options and compare the facts Depending on those criteria to fulfill the wishes of the DMs to compare grades evaluation involves a situation in which a DM must pick amongst several downloaded alternatives given a selected set of commonly conflicting standards. For this motive, the developed complex proportionality evaluation (COPRAS) method can be used in real situations, alternatives The criteria for assessment are vague is related to the factor, And the values of the standards are real Cannot be expressed with numbers [23].

3. RESULTS AND DISCUSSION

TABLE1.Environmental factors that lead to high infertility rates

Country	Pollution Level	Stress Level	Healthcare Access	Diet Quality
Country A	7	6	3	4
Country B	5	8	2	7
Country C	3	4	8	6
country D	9	7	6	3
country E	6	5	4	8

The highest pollution level is observed in "country D" with a score of 9. The lowest pollution level is in "Country C" with a score of 3."Country B" and "country E" have moderate pollution levels. "Country B" has the highest stress level with a score of 8."Country A" and "country D" have the second-highest stress levels with scores of 6 and 7, respectively. “Country C" has the lowest stress level with a score of 4. "Country C" has the highest healthcare access score of 8."Country A" and "country D" have moderate healthcare access with scores of 3 and 6, respectively. “Country B" has the lowest healthcare access score of 2. "Country E" has the highest diet quality score with a value of 8."Country B" has the second-highest diet quality score of 7."Country A" and "country D" have moderate diet quality scores of 4 and 3, respectively. “Country C" has the lowest diet quality score of 6.

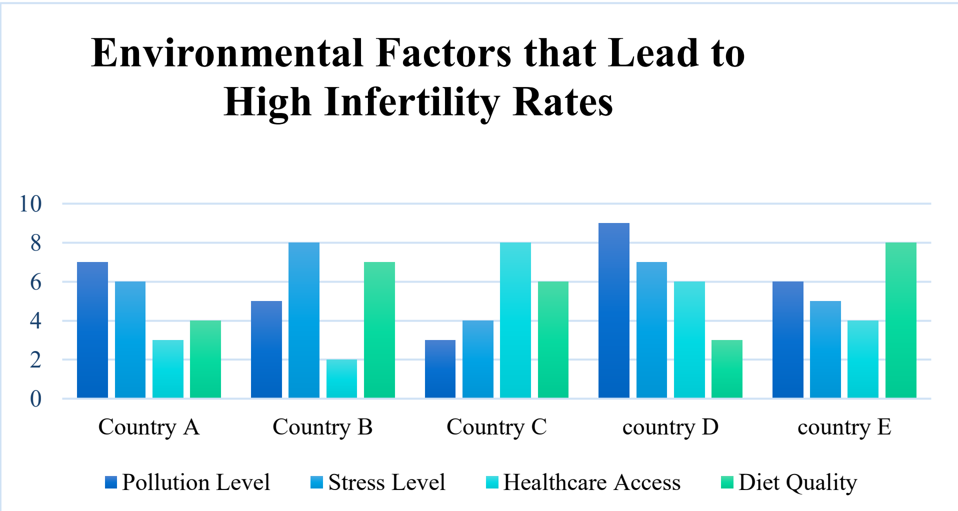

FIGURE 1. Environmental factors that lead to high infertility rates

Figure 1 shows the highest pollution level is observed in "country D" with a score of 9. The lowest pollution level is in "Country C" with a score of 3."Country B" and "country E" have moderate pollution levels. "Country B" has the highest stress level with a score of 8."Country A" and "country D" have the second-highest stress levels with scores of 6 and 7, respectively. “Country C" has the lowest stress level with a score of 4. "Country C" has the highest healthcare access score of 8."Country A" and "country D" have moderate healthcare access with scores of 3 and 6, respectively. “Country B" has the lowest healthcare access score of 2. "Country E" has the highest diet quality score with a value of 8."Country B" has the second-highest diet quality score of 7."Country A" and "country D" have moderate diet quality scores of 4 and 3, respectively. “Country C" has the lowest diet quality score of 6.

TABLE 2. Normalized Data

Normalized Data			
Pollution Level	Stress Level	Healthcare Access	Diet Quality
0.2333	0.2000	0.1304	0.1429
0.1667	0.2667	0.0870	0.2500
0.1000	0.1333	0.3478	0.2143
0.3000	0.2333	0.2609	0.1071
0.2000	0.1667	0.1739	0.2857

Table 2 shows the normalized data comparing the relative performance of the alternatives across four criteria. Higher values indicate a stronger influence on each parameter. Pollution and stress levels vary moderately, while healthcare access and food quality show greater dispersion. This normalization enables a fair comparison between the alternatives by eliminating scale differences in the evaluation criteria.

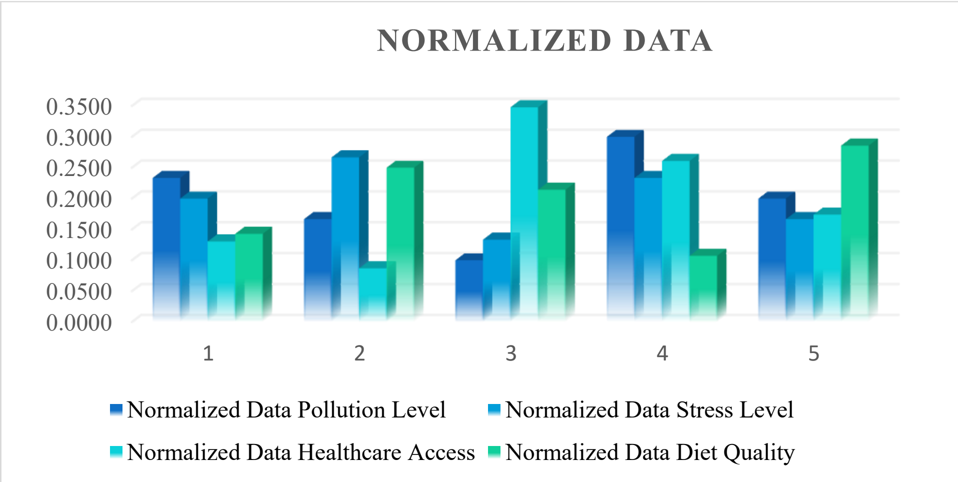

FIGURE 2. Normalized Data

Figure 2 shows the Environmental factors that lead to high infertility rates Normalized Data for Country A**,** Country B, Country C, Country D, Country E Normalized value.

TABLE 3. Weight ages

Weight			
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25

Table 3 shows that the weighting matrix assigns equal importance to all four evaluation criteria; each criterion is given a weight of 0.25. This indicates an unbiased decision-making approach, where pollution level, stress level, access to healthcare, and food quality contribute equally to the overall evaluation of the alternatives, ensuring balanced and impartial assessment results.

TABLE 4. Weighted normalized decision matrix

Weighted normalized decision matrix			
0.06	0.05	0.03	0.04
0.04	0.07	0.02	0.06
0.03	0.03	0.09	0.05
0.08	0.06	0.07	0.03

0.05	0.04	0.04	0.07

Table 4, the weighted normalized outcome matrix, shows that it reflects the combined effect of the normalized values and assigned weights for each criterion. Higher entries indicate a stronger overall contribution of specific criteria to an alternative. The results show variation among the alternatives, highlighting differences in pollution, ress, healthcare access, and food quality impacts in the final evaluation scores.

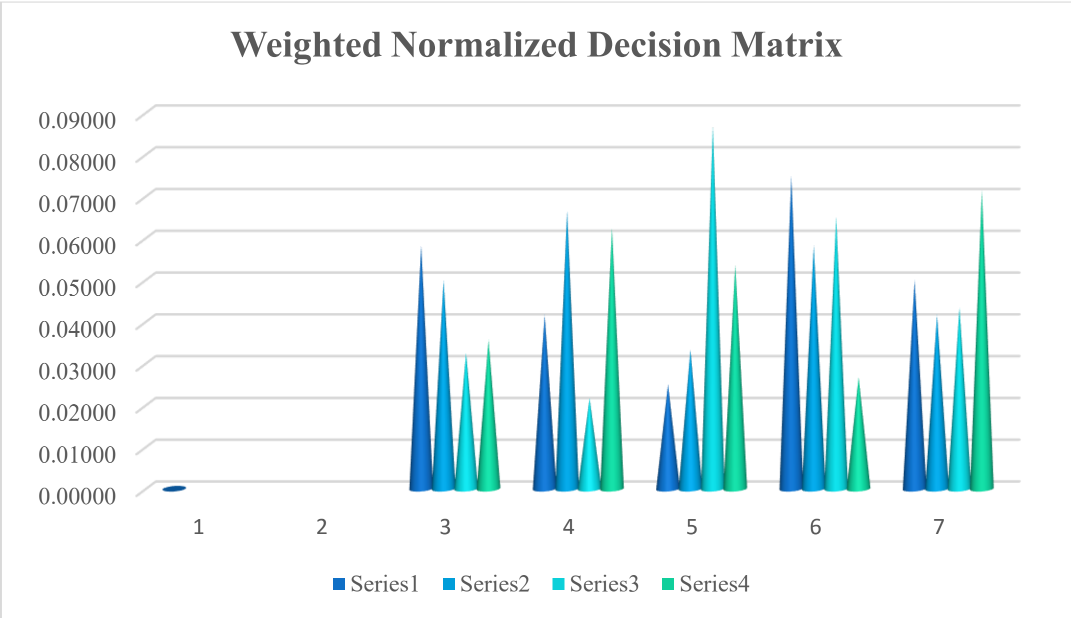

FIGURE 3. weighted normalized decision matrix

Figure 3 shows the weighted normalized decision matrix for Country A, Country B, Country C, Country D, Country E is also multiple values.

TABLE 5. Environmental factors that lead to high infertility rates Bi, Ci, Min (Ci)/Ci

Bi	Ci	Min(Ci)/Ci
0.108	0.068	1.0000
0.108	0.084	0.8111
0.058	0.141	0.4862
0.133	0.092	0.7426
0.092	0.115	0.5946

Table 5 shows Environmental factors that lead to high infertility rates Bi, Ci, Min(Ci)/Ci Country A, Country B, Country C, Country D, Country E it is sum of minimum value.

TABLE 6. Final Result of Environmental factors that lead to high infertility rates

Qi	Ui	Rank
0.246	100.0000	1
0.220	89.4297	3
0.125	50.9217	5
0.235	95.7671	2
0.173	70.5419	4

Table 6 shows the final result of COPRAS for Environmental factors that lead to high infertility rates. Qi is calculated using the Country A is having is Higher Value and Country C is having Lower value. Ui calculated using the Country A is having is Higher Value and Country C is having Lower value

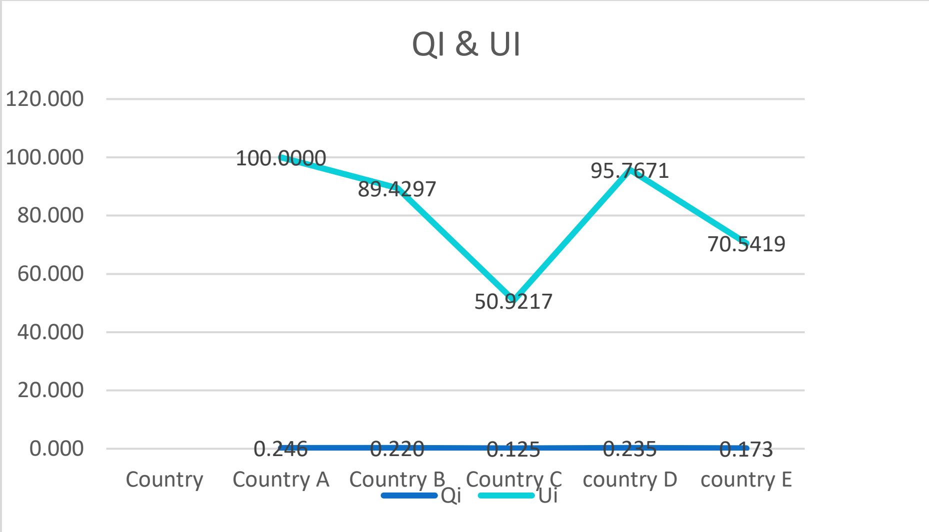

FIGURE 4. Environmental factors that lead to high infertility rates Qi, Ui

Figure 4 shows the final result of COPRAS for Environmental factors that lead to high infertility rates. Qi is calculated using the Country A is having is Higher Value and Country C is having Lower value. Ui calculated using the Country A is having is Higher Value and Country C is having Lower value

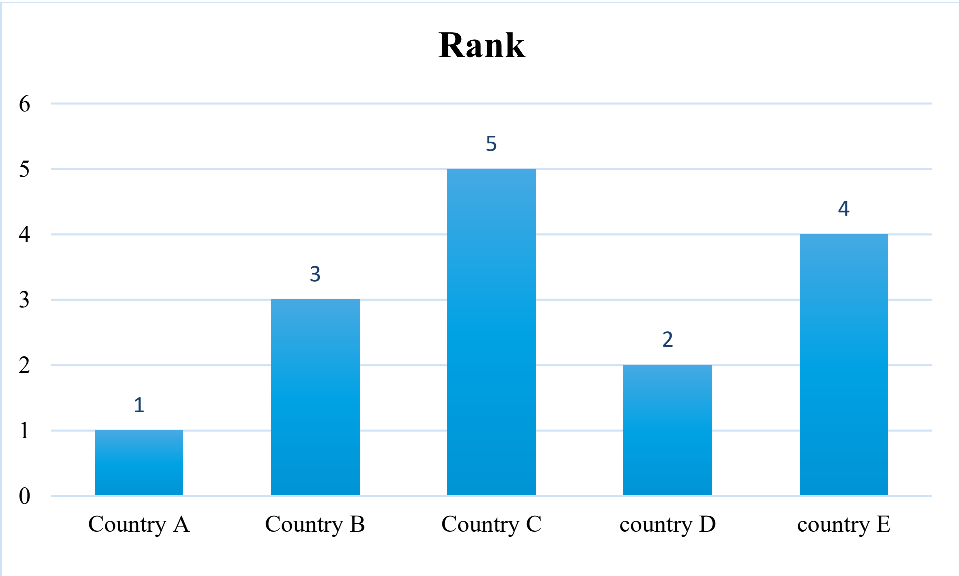

FIGURE 5. Shown the Rank

Figure 5 Shows Ranking of Environmental factors that lead to high infertility rates. Country A is got the first rank whereas Country C is having lowest rank.

4. CONCLUSION

In conclusion, it is evident that a multitude of environmental factors can significantly contribute to high infertility rates in both males and females. These factors can interact and amplify each other's effects, making the issue complex and challenging to address. The modern world's increasing exposure to pollutants, chemicals, and lifestyle changes has led to a disturbing rise in infertility cases globally. The interplay between these environmental factors and individual genetic predispositions further complicates the situation. Several key points can be drawn from the discussion: Chemical Exposure: The presence of endocrine-disrupting chemicals (EDCs) in our environment, such as pesticides, plastics, and industrial pollutants, can interfere with the hormonal balance essential for reproductive health. Reducing the use of harmful chemicals and enforcing stricter regulations on their release can help mitigate their impact on fertility. Lifestyle Factors: Sedentary lifestyles, poor diet, and obesity can disrupt hormonal equilibrium, leading to fertility issues. Encouraging healthier lifestyles through education, access to nutritious food, and promoting physical activity can have a positive impact on reproductive health. Stress and Mental Health: High levels of stress, anxiety, and depression can negatively affect fertility by disrupting hormone production and menstrual cycles. Support systems, mental health awareness, and stress reduction strategies can play a crucial role in addressing this aspect. Radiation and Electromagnetic Fields: Prolonged exposure to electromagnetic fields (EMFs) and ionizing radiation, such as from electronic devices and medical procedures, may impact reproductive cells' DNA integrity. Public awareness and sensible use of technology can help minimize potential harm. Temperature and Climate Change: Rising global temperatures and environmental changes can affect sperm quality and ovulation patterns. Adapting to changing climatic conditions and adopting sustainable practices can contribute to minimizing this impact. Preventive Measures: Early education, awareness campaigns, and regular health check-ups are essential for identifying and addressing fertility issues promptly. Additionally, promoting research into fertility preservation methods can provide more options for individuals concerned about their reproductive future. Collaborative Efforts: Governments, industries, healthcare professionals, and individuals must collaborate to address the complex web of environmental factors leading to infertility. Implementing policies to reduce chemical exposure, improve air and water quality, and support research can have a positive impact. In conclusion, addressing high infertility rates caused by environmental factors requires a multi-pronged approach that encompasses regulatory changes, lifestyle adjustments, mental health support, and technological awareness. By recognizing the intricate connections between human health and the environment, we can work toward a future where fertility is safeguarded for generations to come.

REFERENCES

[1]. Oliva, Alejandro, Alfred Spira, and Luc Multigner. "Contribution of environmental factors to the risk of male infertility." Human reproduction 16, no. 8 (2001): 1768-1776.

[2]. Bala, Renu, Vertika Singh, Singh Rajender, and Kiran Singh. "Environment, lifestyle, and female infertility." Reproductive sciences 28 (2021): 617-638.

[3]. Aka, Venkata Pavan Kumar, and Kiran Kumar Mandula Samuel. "Adoption of SAP FSCM–Enhancing Collections and Dispute Processes in Spain, Portugal, and UK Operations." International Journal of Information Technology and Management Information Systems (IJITMIS) 15, no. 2 (2024): 148-161.

[4]. Leke, Robert J., Jemimah A. Oduma, Susana Bassol-Mayagoitia, Angela Maria Bacha, and Kenneth M. Grigor. "Regional and geographical variations in infertility: effects of environmental, cultural, and socioeconomic factors." Environmental health perspectives 101, no. suppl 2 (1993): 73-80.

[5]. Vidhya Prasanth, Chinnasami Sivaji, M. Ramachandran, Ramya sharma, "Water footprint of a tropical beef cattle production system: impact of individual animal and forage management using the WSM method", REST Journal on Emerging trends in Modellingand Manufacturing, 10(1) march 2024, 39-46.

[6]. Tomaiuolo, Rossella, Iolanda Veneruso, Federica Cariati, and Valeria D'Argenio. "Microbiota and human reproduction: the case of female infertility." High-throughput 9, no. 2 (2020): 12.

[7]. Vander Borght, Mélodie, and Christine Wyns. "Fertility and infertility: Definition and epidemiology." Clinical biochemistry 62 (2018): 2-10.

[8]. Hruska, Kathleen S., Priscilla A. Furth, David B. Seifer, Fady I. Sharara, and Jodi A. Flaws. "Environmental factors in infertility." Clinical obstetrics and gynecology 43, no. 4 (2000): 821-829.

[9]. Abrao, Mauricio S., Ludovico Muzii, and Riccardo Marana. "Anatomical causes of female infertility and their management." International Journal of Gynecology & Obstetrics 123 (2013): S18-S24.

[10]. Negro-Vilar, Andrés. "Stress and other environmental factors affecting fertility in men and women: overview." Environmental Health Perspectives 101, no. suppl 2 (1993): 59-64.

[11]. Park, Shoeun. "Genetic factors and environmental factors affecting male infertility." International Research Journal of Advanced Engineering and Science 1, no. 3 (2016): 115-118.

[12]. Rakesh Mittapally, "Data-Driven Prediction of Mechanical Properties in 3D-Printed Composites Using Hybrid Machine Learning Models." Journal of Data Science and Information Technology 2, no. 2 (2025): 1-16.

[13]. Howards, Stuart S. "Treatment of male infertility." New England Journal of Medicine 332, no. 5 (1995): 312-317.

[14]. Boyles, Abee L.Brandiese E. Beverly, Suzanne E. Fenton, Chandra L. Jackson, Anne Marie Z. Jukic, Vicki L. Sutherland, Donna D. Baird et al. "Environmental factors involved in maternal morbidity and mortality." Journal of Women's Health 30, no. 2 (2021): 245-252.

[15]. Sharpe, Richard M. "Lifestyle and environmental contribution to male infertility." British medical bulletin 56, no. 3 (2000): 630-642.

[16]. Aka, Venkata Pavan Kumar, and Kiran Kumar Mandula Samuel. "Predictive Modeling for Brownfield Migration from SAP ECC 6.0 to S4HANA A Machine Learning Approach for Effort Evaluation Under the SAP Rise Program." International Journal of Computer Engineering and Technology (IJCET) 14, no. 1 (2023): 232-248.

[17]. Agarwal, Ashok, Damayanthi Durairajanayagam, and Stefan S. Du Plessis. "Utility of antioxidants during assisted reproductive techniques: an evidence-based review." Reproductive Biology and Endocrinology 12, no. 1 (2014): 1-19.

[18]. Divya Soundarapandian, "Machine Learning Algorithms for Optimizing Search Personalization and Site Reliability in E-Commerce Platforms: A Comparative Analysis of Linear Regression, SVR, and AdaBoost", Journal of Artificial Intelligence and Machine Learning, 3(4), 2025, 1-7.

[19]. Karthik Perikala, "Architecting Retail-Scale Vector Store Systems for Agentic Generative AI", International Journal of Computer Engineering and Technology (IJCET), 17(1), 2026, 1-14. DOI: 10.34218/IJCET_17_01_001

[20]. Dandasi, V. V. "Credit Intelligence Reimagined: Leveraging Predictive Algorithms for Smarter Commercial Lending Decisions." International Journal of Computer Science and Data Engineering 2, no. 3 (2025): 1-7.

[21]. Yazdani, Morteza, Ali Alidoosti, and EdmundasKazimierasZavadskas. "Risk analysis of critical infrastructures using fuzzy COPRAS." Economic research-Ekonomskaistraživanja 24, no. 4 (2011): 27-40.https://doi.org/10.1080/1331677X.2011.11517478

[22]. Aghdaie, Mohammad Hasan, Sarfaraz HashemkhaniZolfani, and EdmundasKazimierasZavadskas. "Market segment evaluation and selection based on application of fuzzy AHP and COPRAS-G methods." Journal of Business Economics and Management 14, no. 1 (2013): 213-233.https://doi.org/10.3846/16111699.2012.721392

[23]. Kildienė, Simona, Arturas Kaklauskas, and EdmundasKazimierasZavadskas. "COPRAS based comparative analysis of the European country management capabilities within the construction sector in the time of crisis." Journal of Business Economics and Management 12, no. 2 (2011): 417-434.

[24]. Das, Manik Chandra, Bijan Sarkar, and Siddhartha Ray. "A framework to measure relative performance of Indian technical institutions using integrated fuzzy AHP and COPRAS methodology." Socio-Economic Planning Sciences 46, no. 3 (2012): 230-241.https://doi.org/10.1016/j.seps.2011.12.001

[25]. Karthik Perikala, "Architecting MCP-Based Platforms for Enterprise-Scale Agentic Generative AI" 3(2), 2025, 1-8. DOI: https://doi.org/10.55124/JBID.V2I3.264

[26]. Vimala Saravanan, Soniya Sriram, M. Ramachandran, Chitra Periyasamy, "Data-Driven Assessment of Selection Criteria for Commercial Electric Scooters"REST Journal on Advances in Mechanical Engineering, 4(4), 2025, 21-32.

[27]. Tirumala Rao Gundala "Oracle OIPA Cloud Migration Analysis: Machine Learning Models for Predicting Resource Utilization and Success Outcomes." International Journal of Artificial intelligence and Machine Learning 2, no. 3 (2024): 1-8.

[28]. Dhiman, Harsh S., and Dipankar Deb. "Fuzzy TOPSIS and fuzzy COPRAS based multi-criteria decision making for hybrid wind farms." Energy 202 (2020): 117755.https://doi.org/10.1016/j.energy.2020.117755

[29]. Fouladgar, Mohamma Majid, Abdolreza Yazdani-Chamzini, Ali Lashgari, EdmundasKazimierasZavadskas, and ZenonasTurskis. "Maintenance strategy selection using AHP and COPRAS under fuzzy environment." International journal of strategic property management 16, no. 1 (2012): 85-104.https://doi.org/10.3846/1648715X.2012.666657

[30]. TuranogluBekar, Ebru, Mehmet Cakmakci, and Cengiz Kahraman. "Fuzzy COPRAS method for performance measurement in total productive maintenance: a comparative analysis." Journal of Business Economics and Management 17, no. 5 (2016): 663-684.https://doi.org/10.3846/16111699.2016.1202314

[31]. Zolfani, Sarfaraz Hashemkhani, Nahid Rezaeiniya, Mohammad Hasan Aghdaie, and EdmundasKazimierasZavadskas. "Quality control manager selection based on AHP-COPRAS-G methods: a case in Iran." Economic research-Ekonomskaistraživanja 25, no. 1 (2012): 72-86.https://doi.org/10.1080/1331677X.2012.11517495

[32]. Rakesh Mittapally. "Assessing Normality in Healthcare Expenditure Data: A Shapiro-Wilk Test Approach In P"thons." International Journal of Computer Science and Data Engineering 2, no. 4 (2025): 1-8.

[33]. Dandasi, V. V. "Healthcare Data Warehouse Implementation with Machine Learning Regression Analysis: A Comparative Study of Random Forest, AdaBoost, and XGBoost for Regulatory Compliance Prediction." Journal of Artificial intelligence and Machine Learning 2, no. 2 (2024): 1-7.

[34]. Tavana, Madjid, Ehsan Momeni, Nahid Rezaeiniya, Seyed Mostafa Mirhedayatian, and Hamidreza Rezaeiniya. "A novel hybrid social media platform selection model using fuzzy ANP and COPRAS-G." Expert Systems with Applications 40, no. 14 (2013): 5694-5702.https://doi.org/10.1016/j.eswa.2013.05.015

[35]. Tirumala Rao Gundala, "Predictive Analytics for SSO Performance: Improving Authentication Response Times in Oracle Enterprise Environments Using Linear Regression, Random Forest Regression." International Journal of Computer Science and Data Engineering 2, no. 4 (2025): 1-6.

[36]. Divya Soundarapandian, "Algorithmic Framework for Retail Media Optimization and Consumer Engagement Enhancement", Journal of Business Intelligence and Data Analytics, 1(3), 2024, 1-7.

[37]. Kouchaksaraei, RamtinHaghnazar, Sarfaraz HashemkhaniZolfani, and Mahmood Golabchi. "Glasshouse locating based on SWARA-COPRAS approach." International Journal of Strategic Property Management 19, no. 2 (2015): 111-122.https://doi.org/10.3846/1648715X.2015.1004565

