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A narrative review of strategies of human fertility and sustainable development

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Abstract: The study aims to examine five aspects, including the environmental impact, quality of life, contraceptive use, fertility awareness programs, and control of non-communicable diseases as sustainable development objectives to improve reproductive health and sexual well-being of men and women in the Middle East. The United Nations (UN) established eight Millennium Development Goals (MDGs) in 2000, with the target year of 2015 in consideration. Among their goals were the elimination of extreme poverty and hunger, the provision of access to primary education for all, the advancement of women and the promotion of gender equality, and the reduction of infant and maternal mortality. The study used international guidelines or measurement tools to summarize sustainable development goals to ensure improved human fertility and reproductive health, particularly in the Middle East. This study uses a narrative review methodology. The study highlighted the importance of environmental, economic, and healthcare goals to improve reproductive health outcomes in the Middle Eastern population and the requirement for the development of homogeneous procedures for initiating any fertility awareness campaign or instrument before hands-on application. This study provided a baseline framework for developing and implementing sustainable reproductive goals related to human reproductive health and fertility in the Middle East region.

Keywords: *Environmental health, Non-communicable disease, Reproductive health, Sustainability, Total fertility rate.*

1. Introduction

The United Nations (UN) established eight-millennium development goals (MDGs) in 2000, with the target year of 2015 in consideration. Among their goals were the elimination of extreme poverty and hunger, the provision of access to primary education for all, the advancement of women and the promotion of gender equality, the reduction of infant and maternal mortality, the enhancement of child and maternal health, the elimination of HIV/AIDS, malaria, and other diseases, the maintenance of a healthy environment, and the creation of a global partnership for development [1]. The United Nations (UN) built on these Millennium Development Goals (MDGs) in 2015 with 17 sustainable development goals (SDGs) that will dominate the agendas of nations through 2030 [2]. Goals were set in the areas of finance, ecology, education, equity for all people, and health care. Each SDG has a collection of sub-goals and indicators designed to track progress toward the goal [3]. Since the SDGs entered into force in 2016, UN member states have begun implementing the 2030 agenda by developing a transformative action plan to achieve the 17 SDGs.

National development plans of the six member states of the Gulf Cooperation Council (GCC)—Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates—have been revised to reflect the new targets, and the GCC states have reaffirmed their commitment to achieving them [4]. Each nation's strategy was developed independently, taking into account the country's unique set of circumstances, including its population size, economic standing, and cultural norms and values.

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This document explains SDG 3, which focuses on women's health and well-being (specifically targets SDG 3.1 and SDG 3.7). "Good Health and Well-Being" is the title of SDG 3, which aims to secure healthy lifestyles and promote well-being for all people of all ages. The health of women is specifically addressed in two of the nine subgoals (SDG 3.1 and SDG 3.7) that make up this overarching goal. SDG 3.1 aims to bring the number of deaths of mothers around the world to less than 70 per 100,000 live births by 2030. In this context, "maternal mortality" refers to "the death of a woman during pregnancy, delivery, or within 42 days postpartum" [5]. With a worldwide reduction in the MMR of 44% between 2010 and 2014 [6] (it is presumed that this objective arose from the realization of that statistic. Goal 3.7 [7] of the Sustainable Development Agenda is to "provide universal access to sexual and reproductive healthcare services, including family planning, information and education, and the integration of reproductive health into national plans and programs" [7].

The World Health Organization (WHO) established the first official definition of health and well-being in 1948: "a condition of full physical, mental, and social well-being and not only the absence of sickness or infirmity" [8]. This concept served as a cornerstone for the framework of SDG 3, and it guides individual nations as they devise strategies to achieve SDG 3 targets.

The study aims to examine five aspects, including the environmental impact, quality of life, contraceptive use, a fertility awareness program, and the control of non-communicable diseases, as sustainable development objectives to improve reproductive health and sexual well-being of men and women in the Middle East.

2. Methods

2.1. Study Design

The study used international guidelines or measurement tools to summarize sustainable development goals to ensure improved human fertility and reproductive health, particularly in the Middle East. This study uses a narrative review methodology.

2.2. Settings

A narrative review is an appropriate tool to document and analyze the reports because it is one of the review research methodologies through which existing studies are summarized (reports in our case), from which conclusions may be drawn into a holistic interpretation contributed by the reviewers [9]. (Narrative review studies' results are qualitative rather than quantitative and enable the researcher to acknowledge, reflect, and assist the reviewed data [10].

This narrative review focuses on three main themes: achievements, the tools and strategies that were employed, and gaps that remained in the reports. The following section will discuss five aspects, including the environmental impact, quality of life, contraceptive use, a fertility awareness program, and the control of non-communicable diseases, as sustainable development objectives to improve reproductive health and sexual well-being of men and women in the Middle East.

3. Results

3.1. Environmental Health

As per a report of WHO/ UN, "United Nations Environment Programme state of the science on endocrine-disrupting chemicals, approximately 800 environmental chemicals potentially can interfere with receptors, synthesis, and conversion of hormones, and only a capacity of limited environmental chemical to interact with intact organism endocrine system are known.

The health profile of forthcoming generations could influence by climatic changes and air pollution, including fossil fuel combustion through interference with atmospheric processes [11]. Environmental degradation, climatic changes, and natural disasters lead to unsustainable consumption patterns worldwide, triggering difference in the environment, and adversely affecting sustainable growth.

The rise in population growth due to the high birth rate generates more agricultural and natural resource demand stimulating the maintenance domineering. This ultimately affects population health,

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morbidity, and mortality rates, especially in the marginalized population. The inaccessibility to sanitation or water contributes to the disease burden in Asia, Africa, and America [12] (Table 1). In the Middle East, one of the developing constraints is to develop explicit strategies to improve human health, including reproductive health within biosphere ecological limits.

To achieve this sustainable development, a study conducted in 6 countries reported the highest ecological footprint per capita in the United Arab Emirates with HDI (0.85), an ecological footprint of 11.9 (gha/cap), and a footprint to global biocapacity ratio (6.5) using (U.N. human development index – HDI) as development indicator and biosphere based human demand indicator through ecological footprint [13].

3.2. Contraceptive Prevalence

Globally abortion leads to one out of eight maternal deaths. The reproductive health indicator in Sub Sharan and South Asian region showed high fertility and low prevalence of contraceptive usage, assessed the association between the use of contraceptives and risk of mortality and absence of skilled care led to rising mortality rates. This highlights the requirement of family planning to control adolescent fertility. The family planning programs and the effectiveness of contraceptive prevalence are determined through the Total fertility rate (TFR) [14]. In 2016, the Centers for Disease and Prevention- CDC presented "U.S".

Eligibility criteria for contraceptives use – US MEC", illustrating safe and FDA-approved contraceptive use in both men and women with medical conditions (diabetes, HIV, cystic fibrosis, and hypertension) and characteristics (parity, smoking history, age) to assure improvement in reproductive health through high-quality family planning, an initiative of national importance.

The risk factors include using other contraceptive methods, "intrauterine device insertion -IUD" with adverse effects of ovarian hyperstimulation syndrome, or multiple pregnancies. CDC guidelines aim to provide recommendations that remove unnecessary medical restrictions on contraceptives through patient-centered counseling (Table 1) [15]. A study in Saudi Arabia also showed a significant association between oral contraceptive side effects (thromboembolism) and the level of awareness among the population (P value= 0.016) [16]. The TFR decline is related to the use of contraceptives in Sub-Saharan Africa, and the sustainable development goal is to reduce the lack of awareness about available contraception methods, their cost and impact on women's well-being, restricted accessibility and low-quality family planning services, and improve family support. This requires advocacy of international and national guidelines implementation to assure ethical and social contraceptive acceptability in the MENA region [17].

3.3. Fertility Awareness Programs

Most developed countries encourage the involvement of educational and informational tools to improve fertility and reproductive health knowledge through public health initiatives, such as using self-assessment tools to check self-knowledge about human fertility [18]. Websites addressing the potential risks associated with reproductive system and fertility also play a significant role. A study in Australia showed that 59% of females were aware of the impact of smoking and obesity on fertility; however, only 36% were aware of male smoking and 30% of obesity in males' influence on human fertility.

Overall, 40% of participants presented unawareness of the most likely period of the menstrual cycle to conceive [19]. The presence of "fertility assessment clinics" to aid biomedical tests and history taking through healthcare providers also improves awareness [20]. Another study used "FertiSTAT" as a global tool to assess risk factors and their association with infertility among women (Table 1).

It was used in public health campaigns in Portugal, Japan, the U.K., Belgium, and the Middle East. In the Middle East average of 31.58, (SD 18.4; median=30) fertility problems of couples were managed per week [21]. A study in Oman assessed Islamic parents' attitudes and beliefs toward reproductive health education through "comprehensive sexuality education – CSE" to promote well-being and health.

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72.8% of parents supported the program and emphasized the requirement of school nurses and healthcare providers in Oman and other Middle East countries to improve youth health [22].

3.4. Quality Of Life

The introduction of safe, evidence-based clinical practices to improve human fertility through overall improvement in quality of life (QoL). The contributing factors for improving QoL in the Middle East involve economic growth, raised urbanization, more involvement of women in employment, and more participation of men in reproductive or sexual health practices. Inflation, employment, sanitation, food, energy, and water requirements, and housing concerns influence rural areas and cities' sustainability, climate, and environment [16].

Inadequate and poor reproductive health is associated with women's subordination and poverty. The sustainable development goal to improve the quality of life of the Middle Eastern population is through improvement in reproductive outcomes in terms of reduction in undesired conceptions, reduced mortality of others and children, and lower incidence of sexually transmitted diseases and other non-communicable infections through empowerment and accessibility to quality services [23].

3.5. Control of Non-Communicable Diseases

The most prevalent noncommunicable disease globally is obesity which is linked with both male and female rates of infertility [24]. Obesity in males and females can cause several non-communicable diseases such as hypertension, diabetes, etc. Obesity in males leads to semen parameter alteration, such as total count and concentration of sperm which can lead to infertility among males [25]. Whereas, when a woman is of childbearing age, the rate of infertility is increased by 78%, and overweight and obesity increased by 27% as compared to those women who have normal weight [26]. Obesity causes polycystic ovarian syndrome (PCOS) in females which induces metabolic and endocrine disorders occurring in around 6 to 20 percent of females when they are in their reproductive age due to lack of awareness it remains undiagnosed leading to several health complications [27].

Furthermore, A global pandemic coronavirus (COVID-19) developed as a result of "severe acute respiratory syndrome coronavirus 2 – SARS-CoV-2". SARS-CoV-2 comprises amino acids (76%) and binds through spike S- glycoprotein to the ACE2 host receptor. The transmembrane serine protease II led to conformational alterations in spike protein through cleavage, allowing the cell membrane to permanently merge both the host cell and virus [28, 29]. In a study, the Covid-19 patient's sample demonstrated a reduction in the Leydig cells and seminiferous injury [30].

Another study suggested ACE2 expression by Leydig cells is indicative of a direct association between inflammatory cytokines and lower serum testosterone levels, leading to comprised clinical outcomes in SARS-COV-2 patients [31]. Another study reported the spike protein S1 domain binding to the receptor in reproductive tissues, including cyclophilins, angiotensin-converting enzyme 2, Ezrin, and CD.[30] In male severe "SARS-CoV-1" lead to orchitis and germ cell destruction leading to a decline in sperm count and mortality after COVID-19 infection. ACE2 gonadotropin expression is also reported in ovaries and can lead to preterm delivery [32]. The sustainable development goals to achieve the 2030 agenda for sustainable worldwide development were studied in Iran and the Middle East by including education, energy sector advancement with technology resourcefulness, green economy management, food systems management, and labor market invigoration.

The results demonstrated implementation of a single strategy to attain SGD results in improved outcomes compared to combination strategies providing insight to policymakers and the ministry of health to develop sustainable development goals related to male and female reproductive health after exposure to non-communicable disease [33]. Another study conducted among 97 countries, including 7 Middle Eastern countries, studied the global COVID-19 impact on infertility services, indicating that 60% of countries modified their health policies related to fertility and assisted reproductive technology and are now driven to reactivate economic progress through policies and SGDs development without jeopardizing the progress achieved during covid-19 in the health sector [34].

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Table 1.
List of Sustainable development goals with an objective and potential involved risks.

Goals	Organization/study tool	Objectives	Potential Risk Reported
Environmental Health	International Federation of Gynecology and Obstetrics (FIGO)	Ensure the availability of healthy food system and environmental health as an integral part of healthcare to reduce the impact of toxic environmental chemicals on hormones regulating human fertility and development	A potential synthetic estrogen "Diethylstilbestrol" exposure as a toxic chemical at prenatal and preconception resulted in delayed adverse effects including infertility, structural reproductive tract abnormalities, cervix, and vaginal adenocarcinoma, breast cancer among prenatal female exposure and hypospadias among male prenatal exposure. Another important risk factor is exposure to non-communicable diseases, including diabetes, respiratory and endocrine disorders including genital malformation, thyroid-associated neurobehavioral disorders, low birth, and preterm babies, low-quality semen, etc.
Contraceptive Prevalence	Centers for Disease Control and Prevention (CDC), U.S. Eligibility criteria for contraceptives use – US MEC	Ensure safe use of modern contraceptives to ensure improvement in reproductive health through high-quality family planning, an initiative of national importance	The risk factors include using other contraceptive methods, "intrauterine device insertion -IUD" with the adverse effect of ovarian hyper-stimulation syndrome or multiple pregnancies.
Fertility awareness programs	Fertility status awareness tool (FertiSTAT)	In the Middle East, international medical experts and stakeholders adopted (FertiSTAT) to improve fertility care and prevent infertility. The tool included knowledge of reproductive options and relative risk factors, fecundity, and knowledge of reproduction fecundability.	The potential risk indicators influencing human fertility among both genders, including obesity, smoking, age, menstrual cycle, and intercourse timing impact fertility, were identified. Considerable knowledge gaps related to fertility should be targeted in national and ministry of health education campaigns.
Quality of Life	ESHRE Guideline	The socioeconomic and cultural aspects influenced the fertility rate, increased GDP per capita, and improved primary care services.	The risk factors included sexual violence prevention and management, discouragement of traditional harmful practices, i.e., genital mutilation,
Control of non-communicable diseases	2030 Agenda for Sustainable Development	To examine the non-communicable diseases such as obesity, PCOs, and coronavirus on human reproduction, male and female gametes, conception outcome, and neonatal health.	The most prevalent non-communicable disease globally is obesity which is linked with both male and female rates of infertility. It also causes several other non-communicable diseases like PCOs, hypertension, diabetes, etc. in both females and males. Moreover, the spike protein S1 domain binds to the receptor in reproductive tissues, including cyclophilins, angiotensin-converting enzyme 2, Ezrin, and CD26. In males, severe "SARS-CoV-1" leads to orchitis and germ cell destruction, leading to a decline in sperm count and mortality after COVID-19 infection. A potential decline in Leydig cells and seminiferous injury with mild inflammation. ACE2 gonadotropin expression is also reported in ovaries and can lead to preterm delivery.

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3.6. Role of Demographic Transition in Improving Human Reproductive Health and Fertility

The U.N. projection for the rise in population by 2050 predicts an increase to 2.4 billion in the world population [11]. The demographic transition initiates with the up-gradation of public health and living conditions, which decline disastrous transience frequency and severity through sustained mortality debility. During the transition middle stages, the rate of natural difference rises temporarily through later decline of birth rates than death rates. When the birth rate drop catches up with the mortality rate, the natural increase also drops. Eventually, the birth and death rates reach low levels. For instance, Latin American countries began the transition following World War 2.

Demographic transitions lead to an increase in population and impact economic growth. This generated the requirement for family planning and new contraceptive techniques to maintain human fertility and control the birth rate. The requirement of health interventions aside from the health sector enhanced health social elements through policies and metrics to improve quality of life and well-being through a healthy lifestyle [35].

The investment in the health and well-being of the population involves the design and implementation of sustainable development goals by health ministries through integrated health systems incorporation. This must emphasize maternal prenatal and antenatal care, control of infectious and non-communicable diseases, environmental protection, and strategies to address new pandemics or epidemic conditions. The investment in environmental health includes the increase or maintenance of biocapacity. The biocapacity consisted of the productivity of each hector as per times of bio-productive area leading to the protection of the ecosystem and elimination of toxic chemicals from the air [13].

Another considerable SDG is to educate the population about reproductive health. A study examined Muslim perspectives about "adolescent sexual and reproductive health –ASRH" in the Middle East and South Asia and found the influence of socioecological factors on peoples' perceptions, including intra and inter-personnel, community, and institutional factors, and policy factors. These factors led to reluctance, especially the intrapersonal factors indicating healthcare professionals' and parents' negative attitudes towards reproductive health education [36].

This instigates the intervention requirements in the Middle East at the government, stakeholders, and public health practitioner level targeting the community and intrapersonal factors to ensure the implementation of the sustainable goal of education and awareness. The investment in reproductive well-being and child health also results in low fertility rates. Community health programs can aid in addressing gender inequities in the health system, promote a healthy lifestyle including basic hygiene, awareness of deleterious health effects of alcohol and smoking consumption and educate the population about safe sexual relationships leading to subjective well-being [37, 38].

4. Discussion

Regional cooperation was acknowledged as a significant driver of development in Arab nations during the UN Development Group's Arab Development Forum in Amman in 2013 [39]. The MDGs and SDGs are global in character, but they are not universally applicable to all nations; that is, they are not suited to regional and national circumstances, and they do not recognize national priorities. This might explain why certain targets in the GCC reports received greater attention than others.

SDG 3 has nine goals, most of which may be categorized as belonging to one of three related but distinct subsets. These include lowering morbidity and mortality among vulnerable groups (mothers, newborns, the elderly, and children), lowering communicable and non-communicable diseases, lowering risk factors (tobacco, substance abuse, road traffic injuries, and hazardous chemicals and pollution), expanding access to health care, and strengthening the health sector.[41] Achieving one goal might help you accomplish another. For example, meeting the goal of lowering non-communicable and communicable illnesses might help reduce maternal mortality. At the policy level, this may be accomplished by, for example, addressing the prevalence of non-communicable illnesses such as diabetes or decreasing risk factors like obesity and smoking during pregnancy.

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Attaining health and well-being for everyone, including women, is dependent not just on accomplishing women's health and well-being, but also on achieving other SDGs like as reducing poverty, enhancing access to education, and ensuring gender parity [40]. Health and well-being are also dependent on adequate services and resources, such as food security and agricultural production, energy availability, and sustainable use.38 Furthermore, as systems thinking focuses on planetary health [41, 42]. There is growing acknowledgment of the extensive interconnectedness between environmental and human health. These links may be recognized tacitly by GCC states and kingdoms, but they are not made clear in their reports.

States may also assist women's health and well-being by providing reproductive and sexual health services and education, as well as establishing a robust health workforce and maintaining an encouraging research environment.

5. Conclusion

The social, economic, and environmental factors influence the Middle Eastern population's quality of life and reproductive health, and fertility. This study provided a baseline framework for developing and implementing rationale strategies and sustainable reproductive goals to improve healthcare services related to human reproductive health and fertility in the Middle East region.

This report investigated how the GCC nations implemented the UN's SDGs focusing on women's health in their cultures. The analysis found that the effort on MMR was stronger than the work on access to sexual and reproductive health care services based on GCC state reports. This distinction might be attributed to the socio-cultural values, attitudes, meanings, and perceptions of these two concerns. The studies show a lack of a communal vision for well-being. The UN discourse on health and well-being should be worldwide, taking into account social and political determinants of health.

Transparency:

The author confirms that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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