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ENSURING WOMEN REPRODUCTIVE HEALTH THROUGH MULTIFACETED EFFORTS: A KEY TO SUSTAINABLE DEVELOPMENT

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INTRODUCTIONS

Women's human rights, including reproductive health, are protected under international law. Global conferences enable governments to reaffirm commitments, such as the 1995 Beijing Platform for Action and the 1993 UN Conference on Human Rights, ensuring women's sexual and reproductive health is vital for achieving the UN's 2030 Sustainable Development Goals (SDGs). It highlights that gender equality is essential for economic development, with the United Nations advocating for equal access for women and girls in healthcare as a key to sustainable development. [1]

India has made significant progress in maternal health indicators like the Maternal Mortality Ratio (MMR), institutional deliveries, skilled attendance at birth, and prenatal/postnatal care since gaining independence. Despite this, challenges remain, particularly concerning spatial inequality, underlying causes, and care quality. Improvements in these areas are crucial for realizing 'Viksit Bharat' by 2047.

This paper also signifies the role of artificial intelligence (AI) in sexual and reproductive health and rights (SRHR), in enhancing access, efficiency, and personalization in healthcare services. It aids in predictive analytics, helping to forecast fertility cycles, personalizes reproductive health education and advice, ensuring informed decision making. [2]

Key Words: Anaemia, Caesarean-section, Folliculogenesis, Gynaecological diseases, Maternal Mortality, Menarche, Normal-life cycle, Paternity leave, Surogacy, Telemedicine.

ABBREVIATIONS

ART	Artificial Reproductive Technology
AMH	Anti-mullerian hormone
ACE2	Angiotensin-Converting Enzyme 2
ANC	Antenatal care
BMI	Body Mass Index
CEDAW	Convention on the Elimination of All Forms of Discrimination against Women.
FSH	Follicle Stimulating Hormone
LH	Luteinizing Harmone
MTP	Medical Terminated Pregnancy
MMR	Maternal Mortality Ratio
NFSH	National Family Health Survey

PNC	Postnatal Care
PCOS	Poly Cystic Ovarian Syndrome
PSH	Paroxysmal Sympathetic Hyperactivity
IVF	Invitro Fertilization
SRHR	Sexual and Reproductive Health and Rights.

DEFINITION OF OPERATIONAL TERMS

Reproductive rights

Reproductive rights are legal freedoms concerning reproductive health, differing by country. According to the World Health Organization, these rights involve making informed decisions about reproduction, including family planning and protection from discrimination. These rights empower women to control their bodies and make choices about sexuality and reproduction.

The ability for women to control their fertility is fundamental to gender equality, underpinning all other rights. Reproductive rights are recognized globally, allowing individuals to freely and responsibly decide on childbearing and access necessary information and resources. These rights include the highest standards of sexual and reproductive health and protect against discrimination and violence. The International Conference on Population and Development in Cairo, 1994, defined reproductive health as, "complete physical, mental, and social well-being in all reproductive aspects. It emphasized comprehensive reproductive healthcare, including sexual health, aimed at improving life and personal relationships".[36]

Reproductive health

Reproductive health involves complete physical, mental, and social well-being in all aspects related to the reproductive system. It emphasizes not just the absence of disease, but also includes ensuring safe and satisfying sexual experiences. Sexual health aims at the enhancement of life and personal relations, and sexual health services should not consist merely of counselling and care related to reproduction and sexually transmitted diseases. [38]

Reproductive Justice

Reproductive justice is a framework that combines reproductive rights with social justice, emphasizing the right of individuals to have children, not have children, and parent the children they have in safe and supportive environments. It centres on the intersectionality of race, gender, economic status, and cultural identity, advocating for the accessibility of comprehensive reproductive health care, education, and the social, economic, and political resources needed for individual and community well-being.[37]

STATUS OF WOMEN REPRODUCTIVE HEALTH

The shift in women's reproductive health, noting a decrease in the mean age at menarche and an increase in young women becoming sexually active before 20. There's a slight rise in the age of first childbirth over generations. Miscarriage, abortion, and other reproductive health challenges show specific prevalence rates. Gynecological diseases, particularly concerning vulvovaginitis and cervicitis, affect around 50% of women. [4]

Gender inequality deeply impacts women's health and access to healthcare, as it functions as a structural determinant through various intermediary factors. In 2010, India ranked 112th out of 134 countries in the global gender gap index, with only 55% of Indian women being literate. More than half (59%) of pregnant women in India suffer from anaemia, as per NFHS data. This condition spans all wealth levels, with the poorest facing the highest prevalence at 64.3%. In New Delhi, 75.3% of severe anaemia cases were emergencies. Women face barriers due to limited household resources and reduced bargaining power, as noted by Amartya Sen. Discrimination affects women's access to food, family support, and medical treatment, often favouring boys-evident in practices like longer breastfeeding for boys.[3]

In India, unsafe abortions account for about 8% of maternal deaths. A 2019 study revealed higher rates of unsafe abortions among marginalized groups, such as Muslims, Christians, Dalits, Bahujans, Adivasis, and rural women, compared to Hindus. Alarmingly, 67% of abortions are unsafe, causing eight maternal deaths daily. Although abortion is conditionally legal, its criminalization harms marginalized individuals, highlighting the need to address structural issues like caste, poverty, and religion. [5]

In regions where abortion is heavily restricted, 75% of procedures were deemed unsafe in 2017. Conversely, in areas with broader legal grounds for abortion, only about 10% were unsafe. Despite improvements, around 20,000 women still die annually due to unsafe abortions. [6]

In Northeast India, research highlights significant issues faced by ever-married women, including physical (25.1%), sexual (11.8%), emotional (6.4%), and severe violence (5.3%). Among participants, 6.9% experienced non-live births, with a notable percentage facing miscarriages, terminated pregnancies, and STI's. Sexually abused women faced higher risks of these outcomes, underlining the urgent need for policy advancements to protect women's health and rights [7]

NORMAL-LIFE-CYCLE AND FACTORS AFFECTING NORMAL REPRODUCTIVE HEALTH

The "cycle of life approach" in healthcare for women acknowledges the unique needs at various stages of a woman's life, from infancy to old age, from menarche to menopause, emphasizing the importance of reproductive, maternal, newborn, and child health. This holistic framework addresses biological, psychological, social, and environmental factors, underlining the need for continuous care. This approach aligns with Sustainable Development Goals, prioritizing wellness by considering each stage's specific health challenges and opportunities, rather than focusing solely on acute or chronic conditions. A life cycle-based approach, exemplified by the "Well-Woman Chart," offers comprehensive screening recommendations across a woman's lifespan. With the advent of personalized and genomic medicine, healthcare for women is shifting towards a holistic approach. [8]

Factors Affecting: Besides the common and known factors like Gender-based health disparities, Lack of Education, Family Environment, Malnutrition, Cultural Norms, Lack of Self-Care, and Family Planning there are some other major factors that affects the reproductive health of women and can not be taken lightly. These are

No menstrual leave

The Indian Constitution ensures fundamental rights, including equality and dignity in work. Menstrual leave supports these rights by addressing challenges women face during menstruation and preventing gender-based discrimination in workplaces and schools. Implementing menstrual leave is seen as promoting gender equality and recognizing women's unique challenges. The intersection of menstrual leave and human rights, emphasizing the right to health and non-discrimination. Denying menstrual leave can be seen as sex-based discrimination, violating international laws like CEDAW, which advocates for eliminating workplace discrimination.

Devlina Mazumdar supports acknowledging women's biological differences, suggesting menstrual leave could make workplaces more inclusive. [34]

Some schools have implemented menstrual leave policies to allow girls to take time off during their periods. An example is a 2017 initiative in Kerala, where a school provided menstrual leave to reduce absenteeism and help girls manage their periods more comfortably. In 2017, a Menstruation Benefits Bill in India proposed two days of leave per month for menstruating employees, ensuring paid time off.

In 2018, the government introduced the "National Menstrual Hygiene Scheme," providing free sanitary pads to girls in rural areas and establishing hygiene facilities in schools and public spaces. In 2020, the "Menstruation Benefit Bill" was proposed in Parliament, suggesting two days of menstrual leave for female workers. [35]

The menstrual leave policies implemented in various countries to support women experiencing severe menstrual symptoms are;

• Indonesia: Offers two days of menstrual leave each month.
• South Korea: Compensates women for unused menstrual leave.
•Taiwan: Provides three days per month not counted as sick leave.
• Zambia: Allows one day per month, known as "Mother's Day," celebrating women's capacity to become mothers.
• Italy: Proposed a measure in 2017 for three paid days per month, requiring a clinical statement.
• Mexico: Grants one day of leave for serious difficulties.
• Chile: Considering a bill for paid leave for endometriosis and dysmenorrhea.
• Japan: Allows leave for severe period discomfort preventing work.

Likewise, some private firms in India took an initiative for menstrual leave. E.g; The Mavericks, a Gurgaon-based company, allows women to work from home during menstruation for two days. Wet and Dry, a New Delhi company, has implemented a menstrual leave policy. Zomato allows female and transgender employees up to ten days of paid period leave annually to combat menstrual stigma. [33]

Environmental factors

Environment poses a significantly impact on female reproductive health. Cigarette smoking and drinking can disrupt hormones, leading to infertility, miscarriage, and other complications. Exposure to harmful substances like pesticides and chemicals could cause hormonal Imbalances and menstrual issues. Although active smoking in women is low, passive smoking remains prevalent, affecting over 30% of women. Additionally, acoustic pollution and work-related stress

can harm reproductive health. Addressing these ecological and workplace factors are crucial for promoting women's reproductive well-being.[9]

Unnecessary Caesarean section deliveries

A survey found that 1 in 5 pregnant women in India underwent a Caesarean section (C-section) without medical necessity, surpassing the WHO's recommended threshold of 15%. The C-section rate in private facilities is 47.4%, significantly higher than the 14.3% in public facilities. Adopting the WHO's delivery standards could prevent 1.83 million unnecessary C-sections

A 1996 World Bank report highlights a high maternal mortality rate, with about 420 maternal deaths per 100,000 live births, indicating that 15% of deaths in women of reproductive age are pregnancy-related. [4]

No paternity Leave.

India is among 92 countries without national paid paternity leave, despite having high infant mortality rates, similar to Nigeria and China. In contrast, countries like Brazil, and most European nations, offer parental leave benefits. Norway provides extensive parental leave, with options for 49 weeks at full salary or 59 weeks at 80% salary, allowing parents flexibility in taking time off. The key benefits of paternity leave, based on a Swedish campaign include:

• Shared Responsibilities: Equal sharing of childcare duties, reducing the burden on mothers.
• Improved Maternal Health: Allows mothers more time for physical and emotional recovery.
• Career Opportunities: Supports women in continuing their careers by sharing parenting.
• Enhanced Family Bonding: Promotes stronger family relationships by involving fathers early in childcare.
• Increased Workplace Equality: Challenges traditional gender roles, promoting gender equality in both home and work environments.
• Reduced Stress: Eases stress and pressure by providing support during the post-birth period.

The equality between men and women, highlighting that family life and work life are interconnected, impacting each other significantly. [30]

The shift in parental leave policies to involve fathers more in childcare, aiming to reduce the burden on mothers. Correlational studies suggest that fathers who take leave are more engaged in childcare later. This change can potentially alter household labour division and has been shown to affect fertility and couple stability positively. Margolis et al. (2021) found that paid paternity leave in Quebec led to lower separation rates in the first five years after childbirth, especially among egalitarian couples. Farré & González (2019) discovered that paternity leave stabilizes marriages. In Germany, Cygan-Rehm et al. (2018) found that the introduction of paternity leave reduced the risk of single motherhood and indicated benefits such as improved financial situations and increased paternal involvement in childcare. [31]

Positive affirmations and support from the husband and environment help prevent postpartum depression. A significant number of women experience depression post-birth, indicating a need for more support systems. Effective paternity leave should extend beyond childbirth, allowing fathers to support the mother and child, helping with household tasks, and bonding with the baby.

This extended support is crucial for the psychological and physical well- being of the women. [32]

COVID-19

The study examined changes in hormone levels post-COVID-19, revealing significant decreases in anti-Müllerian hormone (AMH) concentration from 1.33 to 0.97 ng/mL and a reduction of Follicle-stimulating hormone (FSH) and luteinizing hormone (LH) levels exhibited notable increases, suggesting a pronounced impact of COVID-19 on female reproductive health and how SARS-CoV-2 impacts women's fertility, particularly through changes in AMH blood levels and the virus's binding ability to ACE2 receptors in the ovaries. This impact can cause significant reductions in AMH (-27.4%) and AFC (-1 antral follicle), along with increases in PSH (+13.6%) and LH (+13.4%). Women with higher BMIs (>25) are more affected by AMH reduction (-39%), while those with a BMI <25 experience a lesser decrease (-20%). These findings suggest that inflammation from severe illness could impair folliculogenesis, modifying female fertility during COVID-19. [11]

INTIMATE PARTNER VIOLENCE AND UNMET NEEDS

Gender-based violence, including rape, domestic abuse and trafficking, significantly impacts women's mental and physical health. It is a major public health concern and a violation of human rights. Globally, one in three women faces violence, often by someone they know, such as a partner or family member. Recognized as a prevalent human rights abuse, international conferences have prioritized addressing this issue to protect women's lives, integrity, and freedom. Violence has severe direct and Indirect effects on women's reproductive and overall health [12]. Violence may have profound effects direct and indirect reproductive health, including:

. woman's unwanted pregnancies and restricted access to family planning information and contraceptives

. Unsafe abortion or injuries sustained during a legal abortion.

. Complications from frequent, high-risk pregnancies and lack of follow-up care

. Sexually transmitted infections, including HIV/AIDS.

. Persistent gynecological problems. Psychological problems.

Contraceptive use among married women in India is very low, with many relying on traditional methods. Younger women face high unmet needs for family planning, as 22% of women aged 15-24 lack access, compared to only 8% of older women. A study found that 51% of recently married women wanted to delay their first pregnancy, but only 10% used contraception. Globally, about 218 million women need modern contraception, but access has been stagnant. There are roughly 121 million unintended pregnancies yearly, with around 60% ending in abortion, many of which are unsafe.

Women facing physical or sexual abuse often fear discussing contraception, leading to higher rates of unintended pregnancies. The World Health Organization suggests that preventing these pregnancies could reduce maternal deaths and improve global health outcomes.

In India, among 60 million adolescent women, 2 million experience pregnancy annually, with 63% being unintended. A lack of modern contraception leads to most of these pregnancies among 15-19-year-olds. Only 52% of those giving birth have adequate antenatal visits. About 78% of adolescent abortions are unsafe, risking complications, and 190,000 don't receive necessary post-abortion care. [14]

MTP AND HUMAN RIGHTS BASED APPROACH

The criminalization of abortion has led to the harassment of medical professionals and pregnant individuals, creating a "chilling effect" on physicians' willingness to provide care for compassionate reasons. Originally, the MTP Act of 1971 strictly controlled abortion permissions as a form of population control. Before 2021, conditional abortions were allowed up to 20 weeks with mandatory approval from registered medical professionals, lacking a rights-based framework that respected pregnant women's autonomy.

The 2021 amendment to the MTP Act extended legal abortion access from 20 to 24 weeks, accessible to all women, not just married ones. It introduced "categories of women" eligible for seeking abortions under special circumstances, such as survivors of sexual assault, minors, women with health issues, and those in disaster scenarios. The Supreme Court in 2022 further affirmed these provisions, emphasizing a broader rights-oriented approach. The organization emphasizes the necessity of addressing political systems and intersecting oppressions through a justice-centered approach, particularly focusing on the most marginalized. [16]

The human rights-based approach to reproductive health emphasizes that it extends beyond the absence of disease. It includes the right to regulate fertility, enjoy safe sexual relationships, and ensures that women can undergo pregnancy and childbirth safely. This approach highlights freedom from coercion and violence, linking reproductive choices to broader social, economic, and political rights. The Indian Supreme Court emphasized that women should have autonomy over their reproductive decisions to ensure fertility regulation without health risks. Reproductive rights include various human rights that have been recognized under different international instruments and thus are part of human rights. These are as follows [17]

1. "*Right to health, Reproductive health and family planning.*
2. *Right to decide the number and spacing of children.*
3. *Right to marry and found a family.*
4. *Right to be free from gender discrimination.*
5. *Right to be free from sexual assault and exploitation*
6. *Right not to be subjected to torture or other cruel, inhuman or degrading treatment*
7. *Right to life, liberty and security.*
8. *Right to privacy*
9. *Right to modify customs that discriminate against women*
10. *Right to enjoy scientific progress and to consent to experimentation".*

These rights have clear implications on all aspects of women's reproductive rights which results into freedom of choice in matters of sexuality and reproduction. There is no doubt that the

reproductive rights are the basic foundations of all other rights of woman and is inalienable and inseparable from basic human rights.

GOVERNMENT INITIAVES AND AI ADVANCEMENTS

The Indian government has been advancing healthcare through the *Ayushman Bharat Health* and Wellness Centres (AB-HWC's) initiative, launched in February 2018. By July 2023, they had operationalized 160,816 AB-HWC's, transforming existing health centers to provide comprehensive, free healthcare services closer to communities. [1]

. *The e-Sanjeevani portal*, over 143.5 million teleconsultations have been conducted, enhancing access to specialist care. Additionally, AB-HWC's conduct screenings for breast, oral, and cervical cancer. The National Free Drugs Initiative offers essential medications freely to those in need.

. *Integrated Child Development Services* (ICDS): This initiative provides nutritional support to pregnant and lactating women. It includes the distribution of supplementary food and health check-ups to improve the nutritional and health status of pregnant women and young children.

. *National Health Mission* (NHM) Programs: Under NHM, several programs focus on maternal health, including free antenatal, intra-natal, and postnatal care, free essential diagnostic services, and free essential drugs for pregnant women.

. *Mother and Child Tracking System* (MCTS): This is a tracking system to ensure that pregnant women and children receive all necessary vaccinations and healthcare services. MCTS helps track and report on maternal and child health indicators.

. *Kilkari and Mobile Academy*: These are part of a digital initiative under which pregnant women and their families receive free audio messages about pregnancy, child birth, and postnatal care on their mobile phones.

. *SUMAN Scheme*: Surakshit Matritva Aashvassn is a program that ensures zero tolerance for denial of services to mothers and newborns at public health facilities, provides free and quality healthcare, and respect and dignity

. *Free Diagnostics Initiative* (FDI) offers essential diagnostic tests across various healthcare levels at no cost, enhancing access to medical services. [20]

. *Janani Suraksha Yojana* (JSY): Promotes institutional delivery through demand promotion and conditional cash transfers.

. *Janani Shishu Suraksha Karyakram* (JSSK), every expectant mother is entitled to free delivery services, including caesarean sections, at public health facilities. This initiative provides free transport, diagnostics, medications, blood, and even diet essentials, ensuring comprehensive care without financial burden.

. *Pradhan Mantri Surakshit Matritva Abhiyan* (PMSMA) grants pregnant women a designated day each month for free, high-quality antenatal check-ups by specialists. This ensures consistent, top-notch medical attention throughout pregnancy.

. *Manyata*; a model to improve the quality of private maternity care for women in low-and-middle income categories.

. *LaQshya,* focuses on enhancing labour and delivery room quality to guarantee dignified, high-standard care for mothers during and after delivery. By improving infrastructure and processes, it seeks to foster a respectful birthing environment.

. *First Referral Units* (FRU's) is pivotal, ensuring that essential resources like skilled personnel and blood banks are accessible for timely and quality maternal care.

. *Outreach camps* are organized to extend healthcare reach, especially in tribal or remote areas. These camps raise awareness of maternal and child health services and help monitor high-risk pregnancies.

. *Information, Education, and Communication* (IEC) and Behaviour Change Communication (BCC), efforts are made to increase awareness and demand for maternal health services, promoting informed and healthy practices among communities.

. *TARANG* intervention, meaning "cascading waves" in Hindi, focuses on empowering newly married women through knowledge, skills, agency, and self- efficacy. By grounding its approach in the theory of planned behaviour. TARANG aims to improve contraceptive use and prevent unintended pregnancies. It includes 14 group sessions centered on decision-making, communication, and relationship building with spouses and in-laws. Additionally, light-touch sensitization sessions are provided for mothers-in-law, fostering healthier marital dynamics and healthy practices among communities. [18]

ART

Over the past three decades, assisted reproductive technologies (ART) have been transformative for many people worldwide, including heterosexual couples, same- sex couples, and singles. With nearly 100 countries providing ART services, over 670,000 children were born through these technologies in 2018. [19]. In India, the ART industry has thrived, becoming key to medical tourism.

ART present significant progress in reproductive rights, yet access remains uneven due to socio-economic and gender disparities, often being available primarily at costly private clinics. The impact of ART is not uniform across social groups, with factors like class and ethnicity exacerbating issues for marginalized communities. Reproductive technologies are increasingly accepted, offering hope to infertile couples. However, these technologies raise constitutional questions and require careful consideration of their ethical implications, particularly in contexts like India. [15]

Sexual health chatbots

These refer a discreet way for individuals to ask sensitive questions without revealing their identity, making them preferable to clinical visits or phone calls. These chatbots assist in symptom checking, advice on STI risks, and serve as information hubs. Their design emphasizes engaging graphics and accessible messaging, especially for young people and minorities. While they excel in sex education by allowing open and anonymous inquiries, there is debate over integrating them with healthcare services. Some believe they could effectively support clinicians and enhance patient-clinic communication. The benefits of using chatbots for sexual health information are: [21]

1. Accessibility and Convenience: Chatbots offer immediate access to health information anytime, anywhere, making them highly convenient.
2. Engagement and Efficiency: They provide reminders, health tips, and reduce text volume, saving users' time in finding information.
3. Reliable Resource: Chatbots act as hubs for links to STI/HIV screening, contraception, and clinical services, offering professional help and support.
4. Non-judgmental Environment: Users appreciate chatbots for being free of judgment, especially when discussing sensitive topics, unlike some health professionals.
5. Anonymity and Privacy: The ability to exchange information anonymously is crucial for users who value privacy,

Tracking and distribution of maternity kits

This paper delves into the application of Artificial Intelligence (AI) in tracking and distributing maternity kits. Originally used to track COVID-19 contacts, Al's role now extends to identifying pregnant women in need, ensuring a systematic distribution of maternity kits. Key benefits include supporting women with special needs, aiding decision-making with data-driven insights, and enabling the future expansion of Al systems to solve complex problems effectively. This innovative approach promises to enhance support for pregnant women, especially in developing countries, by ensuring timely and efficient delivery of necessary resources.[22]

Reproductive health services for adolescents

This encompass various program areas, including counselling, education, and clinical services for family planning. Also covered are legal considerations around abortion, prevention and treatment of sexually transmitted diseases (including HIV AIDS), condom distribution, and bloodborne infection precautions. Efforts to combat sexual violence, discourage harmful practices like female genital mutilation and provide specialized programs for adolescents are also emphasized.[24].

Al Applications in Reproductive Urology

Efforts in reproductive urology are harnessing Al to predict semen quality due to declining fertility rates. The Al models showed high prediction accuracy for sperm concentration and motility, with some models achieving up to 90% success. Advanced methods like the Sperm Whale Optimization algorithm further improved predictions about early detection of sub-fertility through semen analysis and could aid couples planning pregnancy, offering hope for timely interventions.

Al models effectively predicted seminal zinc levels, demonstrating their potential alongside classic biomarkers like FSH. Leptin also showed promise as a predictor of success in sperm retrieval for non-obstructive azoospermia. These findings suggest Al can enhance the identification of biomarkers for infertility.[25]

Embryo Selection for In Vitro Fertilization

In vitro fertilization (IVF), a common infertility treatment, has a success rate of about 45%. The process involves ovarian stimulation, egg retrieval, and fertilization with semen, followed by embryo selection. A study by Khosravi et al. introduced an Al system called "STORK" to improve embryo quality predictions, outperforming human embryologists. This underscores Al's potential in advancing assisted reproductive technologies.[23]

Pregnancy termination factor

The research utilized ensemble machine learning models, including Bagging Classifier, Random Forest, XGB Classifier, Chatbot, and Extra-Trees Classifier, to predict pregnancy termination factors. Accurate predictions can aid healthcare providers, policymakers, and organizations in offering contraceptive services and post-abortion care, potentially reducing unwanted pregnancies and terminations in low and middle-income countries. Comprehensive data collection and machine learning refinement are essential for improving these predictions.[26]

ANC and PNC

Enhancing antenatal care through artificial intelligence is vital for improving the quality of ANC experiences. By employing predictive analytics on pregnant clients' data, Al can forecast potential defaulters and identify high-risk pregnancies. This enables targeted interventions, reduces default rates, and addresses complications efficiently. For example, Al can predict the risk of gestational diabetes, raising awareness and guiding educational strategies to minimize risks, underscoring Al's role in promoting informed healthcare and better outcomes for expectant mothers.[27]

Improving health facility deliveries

Improving health facility deliveries is crucial, as many women still give birth at home, leading to high maternal and perinatal mortality. Predictive Al models offer a solution by providing real-time data to encourage timely healthcare access and optimize resource allocation, reducing maternal complications by 30% in low-resource settings. Al can assist healthcare providers in labour predictions and resource needs, such as caesarean sections. [27]

Streamlining postnatal care

Postnatal care (PNC) is crucial yet often overlooked in low- and middle-income countries. Nearly half of postpartum women there do not access PNC services. Integrating Al into PNC offers transformative potential by enhancing access and efficiency. Al can provide appointment reminders, track symptoms, and alert healthcare providers to risks like postpartum hemorrhage and depression. Wearable devices can notify mothers of upcoming visits, while Al can assess babies' gestational age to tailor care. Virtual assistants can support new mothers with nutrition, breastfeeding, and addressing postnatal issues, making healthcare more accessible and responsive.[27]

Detection of PCOS

The transformative role of machine learning in healthcare, highlighting its capacity to diagnose critical diseases. Focusing on the visualization of the PCOS dataset, it showcases how algorithms

can enhance diagnostic precision through classification reports, underscoring the advancement in medical science. [28]

Artificial Intelligence in Perinatal Medicine and Reproductive Health

Recent research highlights the transformative potential of Al in perinatal medicine and reproductive health. By advancing ultrasound techniques and monitoring during labor, Al can enhance diagnostic accuracy and efficiency. Despite challenges in interpretability, Al fosters tailored care plans by analyzing extensive datasets and identifying risk factors. This technology elevates telemedicine, improves patient outcomes, and aids in managing high-risk pregnancies. Furthermore, Al supports complex surgical procedures like fetal surgery and IVF, offering numerous benefits while navigating associated risks. [29]

Surrogacy

Al significantly enhances surrogacy by streamlining and optimizing various aspects of the process. It improves the matching and screening of intended parents and surrogates through data-driven algorithms, predicting potential risks for more successful pregnancies. Al aids in genetic analysis for healthier embryo selection and enhances medical imaging accuracy for monitoring fetal health.

Surrogacy in India has sparked considerable debate due to concerns over exploitation and ethics. In 2018, the government introduced the Surrogacy (Regulation) Bill to curb commercialization by banning industrial surrogacy, allowing only altruistic surrogacy where compensation is limited to medical costs. This raises constitutional questions. Additionally, complex legal issues around parentage and citizenship arise, particularly in cross-border surrogacy cases.[28]

Telemedicine

By 2021, the UNFPA estimated that over 12 million women faced interruptions in contraceptive access, potentially leading to an additional 1.4 million unintended pregnancies. Recognizing these needs, the World Health Organization classified abortion as an "essential health service," urging governments to reduce barriers.

Research during the pandemic highlighted the effectiveness and safety of telemedicine abortions, showing high satisfaction rates and rare complications. In 2021, the International Federation of Gynecology and Obstetrics advocated for permanent telemedicine abortion access, emphasizing increased patient safety and reduced trauma through earlier medication initiation. They noted that self- screening for ectopic pregnancy symptoms is feasible, challenging the necessity of in-person visits. [6]

Cross border abortions

During the pandemic, cross-border abortion services offered by feminist organizations expanded significantly. Originally established to help women in areas with restricted access to abortion, these services saw increased demand due to COVID-19. The pandemic not only heightened awareness of these available services but also emphasized the role of the internet in guiding women through their options. [6]

Women on web

Women on Web is a Canadian non-profit organization that provides international telemedicine abortion services in multiple languages. It aims to reduce stigma around self-managed abortion and has helped over 100,000 people access abortion pills globally. Despite legal restrictions in some areas, Women on Web advises on safe administration methods to minimize legal risks, ensuring no residual evidence after use. This enables women to claim a spontaneous miscarriage if follow-up care is needed.[6]

CONCLUSION:

The paper emphasizes that to achieve the vision of a developed India by 2047, it is crucial to address the healthcare needs of women of childbearing age, who make up over one-fifth of the population. This involves focusing on maternal and reproductive health through policies that enhance education, awareness, public healthcare services, and infrastructure comprehensively. It highlights that acknowledging menstrual leave as a necessary workplace policy supports women during their menstrual cycles, promoting health and productivity. Additionally, the inclusion of paternity leave is crucial, fostering shared parental responsibilities and gender equality. The paper also underlines the transformative role of Al in reproductive health, such as predicting ovulation and providing personalized health insights, addressing unmet needs and improving care efficiency. Overall, empowering women's reproductive rights not only enhances individual well-being but also supports broader societal and economic progress.

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