CONCEPTUAL MODEL OF INFERTILITY PREVENTION

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In holistic interpretations of health (e.g., WHO), prevention needs to target physical and non-physical aspects of disease and be delivered continuously over the life course (Baird et al. 2017). Modifiable causes and risks for infertility and fertility problems can be eliminated or minimised through primary prevention, but non-modifiable causes need management and prevention of significant disease burden. Fertility awareness is a key feature of prevention efforts; it refers to knowledge of reproduction, fecundity, fecundability, related risk factors for infertility, and reproductive options for family building (Zegers-Hochschild et al. 2017). Despite strong links between a diversity of global risk factors (e.g., infectious, environmental, occupational, behavioural, age) and fertility problems (Bayoumi et al. 2021) a global lack of knowledge about fertility and infertility has been demonstrated. Gaps in knowledge need to be addressed through prevention efforts.

However, a conceptual model for prevention of fertility problems is lacking despite a plethora of research designed for prevention. Figure 1 illustrates the types of preventive interventions, mechanisms of action and outcomes in extant research organised in a conceptual model. Key aspects of this model are heterogeneity and complexity. Heterogeneity is evident in (a) nature of preventive efforts being delivered at diverse societal levels and points in the reproductive life course, (b) proposed mechanisms of action that include decision-making and behaviour change at individual levels but also organisational and policy change, and healthcare provision, and (c) proximal and distal outcomes that relate to monitoring of mechanisms of action, and prevalence and impact of disease. Future prevention research should aim to design studies using conceptual models of fertility prevention.

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**Types of Intervention**

(Activities that could reduce infertility or promote fertility health)

- Individual & couple
  - Personalised fertility advice and assessment
- Public Health and Educational
  - Fertility education
- Public health campaigns
- Preconception Care
- SRH interventions
- Institutional
  - Healthcare training
- Occupational & Environmental Health
  - Societal
  - Cultural and religious practice
- Fertility promoting policies

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**Intervention “mechanisms of action”**

- [that lead to reduced infertility/fertility health (i.e., how interventions achieve outcomes)]
- Primary prevention (condition/disease not yet present)
- Enacted decisions and informed decision-making
  - Cultural practices (e.g., remarriage/void marriage, female genital cutting)
  - Postponing parenthood
- Life-style change
  - Reduction in unhealthy habits (e.g., smoking, drinking, anabolic steroids)
- Uptake of protective behaviours
  - Increases in protective behaviour (e.g., condom use, HPV vaccine)
- Preconception care (targeted at fertility)
- Optimisation child-bearing timings (relative to preferences/prevention)
  - Optimal age starting to achieve pregnancy (e.g., in the reproductive window)
- Uptake reproductive options (e.g., egg freezing)
- Reduction workplace and environmental threats
- Determination of occupational exposures
- Environmental health protection
- Secondary prevention (condition present but not yet fertility limiting)
- Timely medical help-seeking (e.g., early detection & access to treatment)
- Earlier treatment for reproductive tract infections
- Screening for genetic predisposition (e.g., male infertility)
- Uptake of reproductive options (e.g., fertility preservation) in relevant groups
  - (e.g., cancer, haemophilia, later parenthood)
- Antenatal prevention (condition present, fertility limiting)
- Access to fertility care
- Earlier consultation for diseases (e.g., endometriosis, STIs, tubal diseases, premature ovarian insufficiency, reversal sterilisation, recurrent pregnancy loss, cancer)
- Reduction in harmful fertility medical practices
  - Dilation and curettage, emergency gynaecological surgeries (e.g., ovarian drilling, unsafe maternal care and abortion)

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**Outcomes**

1. Indicators of mechanisms of action (mechanistic research)
   - Increased fertility awareness and knowledge of infertility
   - Optimal age at first birth relative to preferences
   - Decrease in risks and hazards and increase in protective behaviour and timely medical help-seeking

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**Prevalence (data sources)**

- Reduction in prevalence of infertility (e.g., population surveys)
- Reduction in prevalence of preventable infertility (e.g., tubal, ovulatory, sperm count, older parenthood) (e.g., national data)
- Improved access to fertility care (e.g., ART, fertility preservation) (e.g., registries)
- Improved use of fertility care (e.g., national data)

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**Impact**

- Quality of life (FertKoAL, QALYS)
- Reduction in stigma related to childbearing preferences and timing
- Improved quality of life for people with fertility problems (e.g., World Bank, QALYS)
- Reducing decisional conflict

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**Figure 1:** Conceptual model for prevention of infertility and fertility problems drawn from empirical prevention research. Yellow = indicates types of interventions delivered at different individual and societal levels. Green = indicates mechanisms of change targeted in research from pre-disease to post-disease states. Blue = indicates prevention outcomes targeted which could be indicators of mechanisms of change or fertility-related outcomes. White = moderators affecting effectiveness of prevention effort.
References

