

## Expanding access to assisted reproductive technology in a developing country: getting more for less.

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### Abstract

**Background:** Infertility is a universal health burden with profound consequences in low/middle-income countries (LMIC). The global prevalence of infertility is between 8-12 % with values as high as 32 % in Central and Southern Africa, often referred to as the “infertility belt” [1]. In Nigeria, a prevalence rate of between 20-30% has been estimated due to the high prevalence of sexually transmitted infections [2]. The consequences of involuntary childlessness in a low/middle-income country can be devastating, leading to economic deprivation and impoverishing medical costs [3]. There is a high premium placed on childbearing in developing countries due to the socio-cultural beliefs and practices, yet there exists a high disparity between urban and rural dwellers with respect to accessing health care [4].

**Challenge(s):** There is an unmet need for assisted conception in sub-Saharan Africa as published data suggest less than 1.5% of the African population have access to assisted conception services [3]. This is further compounded by the high tubal factor infertility requiring in-vitro fertilization. Assisted conception requires significant investment in manpower and infrastructure, the cost of which is borne by the patients seeking care. Invariably, assisted conception is strenuous, time consuming, expensive, and often inaccessible to the financially vulnerable. Out-of-pocket payment for services is a major limiting factor in developing countries as insurance coverage and government support are lacking. In the absence of financial protection, out-of-pocket payments can ultimately lead to household poverty [5].

**Opportunities:** Expanding access to Assisted Reproductive Technology in developing countries will alleviate the impact of infertility which has been declared an issue of Public Health importance by the World Health Organization [6]. Embracing low-cost treatment protocols and partnerships via the hub-and-spoke organization design with relevant stakeholders may be the panacea in developing countries, as resources are far from equitable.

**Conclusion:** A paradigm shifts by government towards prioritizing infertility management against the background of a delicate balance between overpopulation and paucity of resources will provide succor to the financially vulnerable and often forgotten infertile couples.

**Keywords-** Access, Assisted Reproductive Technology, Developing Country.

### Résumé

**Contexte:** L'infertilité est un fardeau de santé universel avec des conséquences profondes dans les pays à revenu faible ou intermédiaire (PRFI). La prévalence mondiale de l'infertilité se situe entre 8 et 12% avec des valeurs aussi élevées que 32% en Afrique centrale et australe, souvent appelée «ceinture d'infertilité» [1]. Au Nigéria, un taux de prévalence compris entre 20 et 30% a été estimé en raison de la forte prévalence des infections sexuellement transmissibles [2]. Les conséquences de l'absence d'enfant involontaire dans un pays à revenu faible ou intermédiaire peuvent être dévastatrices, entraînant une privation économique et une diminution des frais médicaux [3]. Les croyances et pratiques socioculturelles accordent une grande importance à la procréation dans les pays en développement, mais il existe une forte disparité entre les citadins et les ruraux en ce qui concerne l'accès aux soins de santé [4].

**Défi (s):** Il existe un besoin non satisfait de procréation assistée en Afrique subsaharienne car les données publiées suggèrent que moins de 1,5% de la population africaine a accès à des services de procréation assistée [3]. Ceci est encore aggravé par l'infertilité tubaire élevée nécessitant une fécondation in vitro. La conception assistée nécessite un investissement important en main-d'œuvre et en infrastructure, dont le coût est supporté par les patients qui recherchent des soins. Invariablement, la conception assistée est ardue, longue, coûteuse et souvent inaccessible aux personnes financièrement vulnérables. Le paiement direct des services est un facteur limitant majeur dans les pays en développement, car la couverture d'assurance et le soutien gouvernemental font défaut. En l'absence de

protection financière, les paiements directs peuvent en fin de compte conduire à la pauvreté des ménages [5].

*Opportunités:* L'élargissement de l'accès aux technologies de procréation assistée dans les pays en développement atténuera l'impact de l'infertilité, qui a été déclarée problème de santé publique par l'Organisation mondiale de la santé [6]. Adopter des protocoles de traitement à faible coût et des partenariats via la conception d'organisation en étoile avec les parties prenantes concernées peut être la panacée dans les pays en développement, car les ressources sont loin d'être équitables.

*Conclusion:* Un changement de paradigme du gouvernement vers la priorité à la gestion de l'infertilité dans le contexte d'un équilibre délicat entre la surpopulation et la rareté des ressources apportera une aide aux couples infertiles financièrement vulnérables et souvent oubliés.

**Mots clés:** *Accès, technologie de procréation assistée, pays en développement.*

## Background

Involuntary childlessness is a devastating health challenge in developing countries as health refers to a state of complete mental, physical and social wellbeing and not merely the absence of infirmity. Infertility refers to the inability of a couple to achieve conception after 12 months of unprotected intercourse. Globally, it has been estimated that over 180 million people are infertile with male infertility contributing at least fifty percent of all cases [7]. About 8-12 % of couples worldwide are known to have challenges with conception and wide variations have been documented between countries with an "infertility belt" occurring in Central and Southern Africa [1,8]. Infertility has been reported as one of the commonest reasons for gynaecological consultations in sub-Saharan Africa and its high prevalence has been attributed to infectious morbidities, especially sexually transmitted diseases and post abortal sepsis [9,10].

Secondary infertility is more common in low-income countries especially Latin America, Asia and Africa [11]. This has been attributed to poorly treated infectious morbidities and in Africa about 85% of women are estimated to have infertility arising from infections; this figure thought to be double that of the rest of the world [11]. Generally, infertility is classified as either male or female factors. This can be further grouped into core factors such as genetic, hormonal, anatomic and immunological which are responsible

for approximately 5 % of the global burden of infertility. The other group includes preventable causes largely iatrogenic with varying rates worldwide. Preventable causes of infertility are generally the result of interrelated factors such as reproductive tract infections, environmental factors, socio-cultural factors and healthcare practices.

The goal of managing infertility is hinged on an accurate diagnosis of the aetiology coupled with the deployment of treatment modalities that guarantee the highest chance of success evidenced by pregnancy [12]. Treatment options for infertility are often categorized into Medical (Pharmacological), Surgical and Assisted Reproductive Technology (ART). Women that have ovulatory dysfunction without any other abnormality such as tubal damage or male factor infertility will benefit from medical therapy using ovulation induction agents such as clomiphene citrate, letrozole or a combination with gonadotrophins. Tubal surgery is indicated when there is tubal damage and failure to achieve pregnancy would necessitate the deployment of ART. Indications for ART include tubal damage, premature ovarian failure, male factor, and unexplained infertility.

Assisted Reproductive Technology is capital intensive and requires investment in personnel training, infrastructural development and provision of supplies including medications and consumables. It is far from equitable in developing countries as ART services are offered only to those who can pay. The main challenge in LMIC is the remarkably high fixed and running cost [3,13] of maintaining such facility. Bridging the gap will entail the deployment of low cost In-Vitro Fertilization (IVF) services coupled with collaboration among fertility centres with the sole purpose of pooling resources and sharing overhead cost.

## Assisted reproductive technology in Sub-Saharan Africa- a reality or fallacy?

Infertility prevention and management, a challenge in Africa and has remained a neglected issue by most governments except for South Africa and Egypt [3,14]. However, feeble attempts have been made since 2001 following the World Health Organization's (WHO) sensitization meeting in Geneva where the Medical, Social and Ethical aspects of assisted reproduction were discussed. The meeting recognized infertility as a public health burden especially in developing countries and suggested that infertility management should be incorporated into the National Reproductive Health Care programmes of all countries. The meeting further emphasized the

need to make ART complimentary to other ethically acceptable socio-cultural treatment modalities for involuntary childlessness.

The European Society of Human Reproduction and Embryology (ESHRE), in 2006 set up a special task force dedicated to infertility management in developing countries. It aimed at providing the necessary technical support via collaboration with low and middle income countries. Various other bodies have supported the initiative of low-cost ART in developing countries such as The Walking Egg non-profit organization (TWE npo) with the view to reducing the laboratory cost associated with ART in the areas of ovarian stimulation, oocyte fertilization and embryo culture [15].

There is an unmet need for ART in Nigeria and this challenge can be mitigated by reducing the running cost of ART services through collaboration and investment in human capacity development. It has been estimated that about 1500 IVF cycles are required per million people to meet the population requirement for ART [16]. A major challenge to the utilization of ART services in Nigeria is the prohibitive cost occasioned by endemic poverty. This is in sharp contrast to what obtains in many developed countries where specific numbers of ART cycles are reimbursed by government via health insurance [17]. The quality assurance of ART procedures in developing countries constitutes an important limiting factor that must be addressed. Sequel to the unavailability of National Regulatory Agencies in many developing countries, ART clinics generally adopt or formulate their own regulations thus resulting in varying standards of care [18]. In Ghana, five major challenges were found to affect the uptake and utilization of ART. These included high cost of ART treatment, the long distance to treatment centers, drug treatment challenges, disturbances in daily routine and work, and anxiety about ART outcome [19].

Controversies and misconceptions have trailed the provision of fertility treatment in developing countries. The argument of population overgrowth and limited resources especially in Africa should be delicately balanced against the background of unmet ART services for those who would benefit. In some quarters, it has been suggested that the infertile couple in resource poor nations should be encouraged to accept their state of involuntary childlessness [20]. Population overgrowth has been of great concern in developing countries and concerns have been raised about the consequences of providing affordable ART services in the context of prevailing overpopulation and scarce resources. Contribution by ART to population growth has been estimated to account for

less than 1% of all deliveries [21]. Improving health education and family planning services has been suggested as mitigating factors to this minimal contribution to the fertility rate [21]. Reproductive autonomy and not necessarily fertility reduction is needed in developing countries such that family planning and infertility management are integrated into reproductive care services.

### **Isolation or Collaboration? Getting more for less.**

A retrospective review of cycle-based data in Africa over a 5-year period revealed 153,917 assisted reproductive technology procedures from 73 centres in 18 countries [22]. It was inferred that the uptake and utilization of ART services were low and autologous fresh ART cycles were the most common procedures performed with little deviation in clinical pregnancy rate per oocyte aspiration [22]. While ART has given hope to millions across the globe, it has also opened a vista of numerous legal, ethical, and social challenges [23]. In developing countries, concerns have been expressed about equity and access to ART which invariably is available to couples who can pay for these services. The average cost of assisted reproduction in Nigeria, has been estimated to range between 2800 to 3000 USD [24] with ART centres mostly located in urban centres to suite the expected clientele.

The practice of ART in many developing countries is largely individualized with little or no collaboration. This system of practice is capital intensive requiring huge investments in infrastructure and human capital resource. The need for synergy in developing countries is most compelling in the face of dwindling financial resources and cannot be over emphasized. There is also an increased need for greater efficiency and higher success rates thereby making collaboration in LMIC imperative. Collaborative efforts in ART services will ultimately decrease overhead costs and eliminate wastages through shared responsibilities.

### **The hub-and-spoke organization design.**

The hub-and-spoke service delivery design has been in practice in the United Kingdom for several years and has been an avenue for serving patients efficiently and effectively [25]. This design organizes service delivery into a system comprising a central hub (anchor establishment) offering a wide range of services which is interlinked with smaller secondary establishments (spokes) which provide fewer services [25]. The hub-and-spoke design affords unique opportunities to optimize efficiencies and effectiveness

through strategic centralization of advanced or highly technical services at the hub and distribution of less advanced services to smaller peripheral sites (spokes). This system of service delivery was popularized by the airline industry to manage limited resources and drive-up profits through increased efficiency via networking, thereby accomplishing more for less [26,27].

The hub-and- spoke service delivery design is implementable in resource constraint countries like Nigeria and has the potential to eliminate wastages by enhancing service delivery through collaboration and cost sharing. This is particularly relevant due to the inability of the government to meet the reproductive health needs of its citizens. Synergy at all levels of care will improve efficiency and service delivery through better inventory and judicious use of scarce human and material resources.

Getting more for less in LMIC entails establishing ART hubs in major cities equipped with a large capacity for embryo culture and development. These hubs will have domiciled experienced fertility specialists, nurses and embryologist who will provide joint clinical management of patients from the peripheral centres (spoke). They will provide ART treatment and provide feedbacks to the fertility teams at the peripheral centres thus engendering standardized care via quality control. This partnership will allow pooling of resources, shared responsibilities, and greater output in terms of better success rates. These hubs in LMIC may be solely private or a public private partnership (PPP) with government health institutions. The PPP model has been described as a viable option in Nigeria and should be supported and encouraged by government in the acquisition of hospital equipment [28]. The peripheral centres (spokes) should be equipped with facilities for drug storage, transvaginal scan and laboratory for basic investigations including hormone profiles.

These spokes should be furnished with standardized protocols for oocyte stimulation and monitoring. Oocyte aspiration and embryo culture is booked at the Hub where such facilities are available for use at an agreed cost. This system has the added advantages of decreasing the financial burden on the patients, increasing synergy between practitioners, enhanced training especially at the hubs, easing treatment through cost sharing and improving third party treatment (donor pooling & oocyte sharing). This system is not without its fair share of problems such as disputes in areas of responsibilities for medical errors, finance and data ownership. These problems are, however, surmountable through

strategic centralization and exercising great care with documentation and agreements.

## Conclusion

Expanding access to ART in developing countries has become imperative in order to bridge the perceived injustice in its availability and uptake by only those who can afford to pay out of pocket. The current reality in many LMIC involves ART centres replicating operations across multiple locations with limited capacities and efficiencies. Getting more for less through strategic partnerships and domesticating the hub-and- spoke service delivery design in developing countries would begin the process of reducing the unmet needs for advanced fertility care in resource challenged countries. Adopting the public private partnership model may be the logical means for raising start-up capital in developing countries through its inherent flexibility thus aiding the prioritization of limited resources.

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