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Epidemiology of diabetes among people with infertility issues in Delta North, Delta State, Nigeria: Empirical review

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ABSTRACT

***Background*:** Diabetes and infertility are public health problem. Diabetes mellitus (DM) is a metabolic disease involving inadequate control of blood glucose level. Its complications affect fertility in both men and women. Infertility is the inability of a couple to conceive even after one year of unprotected, frequent sexual intercourse. Diabetes contributes to a decline in global birth rate due to its effects on fertility, especially in those societies with high diabetic prevalence.
Objective: To ascertain the prevalence of diabetes among people with infertility.
Method: This was a traditional review the online literatures on diabetes among people with infertility. The SANRA principle was followed.
Result: According to available date, there has been recorded decline fertility over the decades. Globally prevalence of male infertility is high 42.4% in Nigeria is higher, than in some country. Decline in fertility as being reported by world data is not only about infertility but because the population decides to stop having children. Studies on prevalence of infertility in DM partners of infertile couples revealed decline in the sperm mobility and increase in sperm abnormal morphology. Nigeria being the most populated country in Africa has up 4 million people with diabetes, 70% to 80% of the 4 million remains undiagnosed and untreated. IDF predicts that's 784 million adults will have diabetes by 2025.
Conclusion: Diabetes mellitus which is marked with elevation of blood glucose level is a health condition with increased morbidity and mortality. Modification of life style and adequate treatment can improve the health and reduce complications thereby also reducing infertility.

Keywords; diabetes mellitus, infertility, prevalence, pathogenesis.

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1: Introduction

1.1: Overview

Diabetes mellitus and infertility are public health problem affecting both male and female of reproductive health (Condorelli, 2018). Diabetes has been associated with reproductive dysfunction, due to its complication on human health (Zaimi, 2024). The disorder is seen in up to 40% of women that has diabetes mellitus and manifest itself in delayed menarche, amenorrhea, menstrual irregularity, menorrhagia, PCOS, early menopause and infertility (Zaimi, 2024)

Diabetes contributes in decline in global birth due to its effects on fertility especially in those societies with a high diabetic prevalence (Maresch, 2018). The effect of DM in men manifest itself in spermatogenesis disorder, maturation disorder, testicular cell damage, erectile dysfunction (Huang, 2024). Hyperglycemia and its consequence are responsible for the effect of DM on reproductive health (Cretu, 2020). Effective control and prevention of diabetic complication improve health condition and increases fertility rate close to their counterpart (Livshit, 2009).

Infertility is a disease of a male and female reproductive system defined by the failure to achieve pregnancy after 12months or more of regular unprotected sexual intercourse (WHO, 2024). It is a public health problem affecting millions of people with heavy impact on families and communities, approximately one in every six people of reproductive age worldwide experience infertility (WHO,2024).

1.2: Aim of the study

The purpose of this study is to elucidate the epidemiology of DM among people with infertility issues and identify the potential mechanisms leading to infertility.

1. Compare prevalence of infertility in Nigeria relative to global levels
2. Evaluate prevalence of DM among infertility in Nigeria, with a focus in Delta State

1.3: Review method

This followed the traditional review approach with cognizance of SANRA principles. Literatures were obtained from online materials including Google Scholar and PubMed database as well as

Our World in Data (OWiD). Literature search in PubMed for epidemiology of DM followed the scoping method about 228,315 articles. Screening for epidemiology of DM among individuals with infertility issues yielded 42 results. With goggle scholar, search for epidemiology of DM showed 2,590,000 results. Out of these articles, 175 results were found on diabetes mellitus and infertility issues.

2: The narrative discourse

2.1: Prevalence of infertility – global view

Based on previous studies, the lowest and highest prevalence of infertility have been reported in Australia and Africa respectively, 10% -15 %of the world's population has been reported to have infertility issues (Moghaddan, 2016). Globally, infertility is a public health issue,40 million couples actively sought treatment for infertility in 2010, 34 million were in developing countries, female factor is responsible for 35%, male factor for 45%, 20% for unexplained infertility or combined factor (Fatima, 2024). There are 48.5 million infertile couples worldwide with highest rates in females, the two regions of the world with the highest rates of infertility are South East Asia and Sub-Saharan Africa (Obeagu, 2023). In Africa, estimated prevalence of infertility is about 30%-40%, about 10%-15% of couples in Uganda experience involuntary childlessness, which translates to 5million couples with infertility in Uganda (Asiimwe, 2022).

It is estimated that 56% of infertile couples of child bearing age seek medical support (Boivin, 2007). Equal proportion of infertility cases are attributed to male and female problems (Fig 1) (office communication, 2021). Infertility has been documented to increase with age, and higher among the men (Fig 2), before menopause factor comes into effect among women, in attempt to compare prevalence at global levels, available evidence seems to indicate over 42% in Nigeria, which is more than double that of France, that in turn is about four times greater than in North America (Fig 3) (Ejikemans, 2014).

According to available global data (Roser, 2014; UN WPP, 2024), there has been recording of declining fertility (i.e. increasing infertility) over the decades (Fig 4). This has attributed to three main reasons increased work hours and cost of living as well as reduced child mortality (UN WPP,

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2024). However, it is pertinent to note that these three factors are neither pathological nor physiological phenomena, but social concepts of infertility.

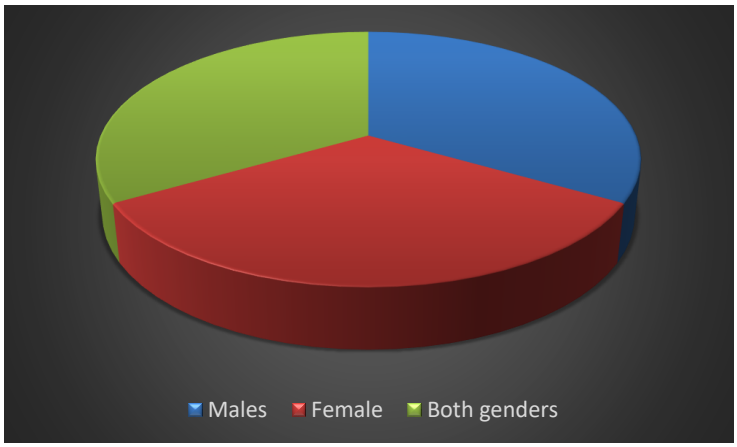


Fig 1. Attribution of infertility to gender groups (Office of Communications, 2021)

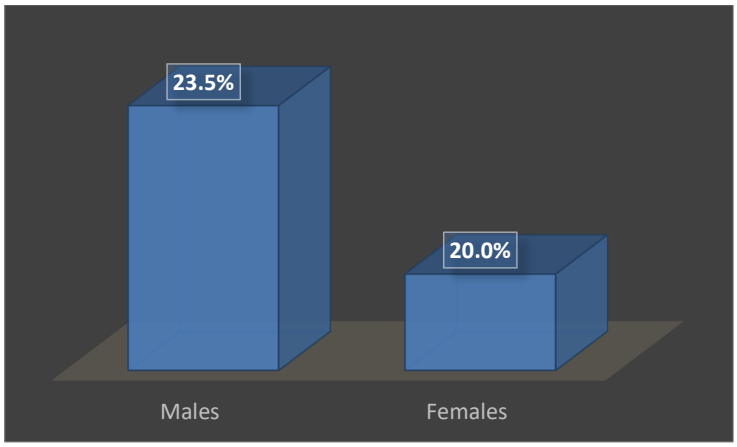


Fig 2. Infertility in gender groups at 38±2 years age (Dunson, 2004; Eijkemans, 2014)

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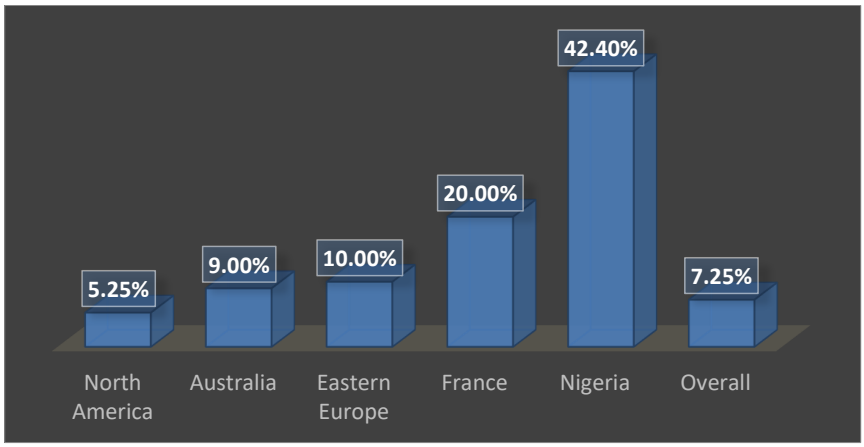


Fig 3. Global view in prevalence of male infertility (Eijkemans , 2014; Leslie, 2024)

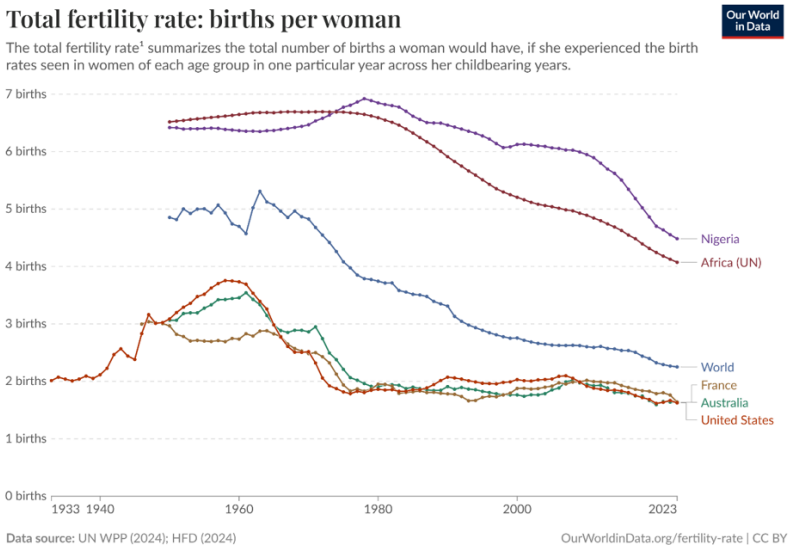


Fig 4: Global decline in fertility translating to increased infertility (UN WPP, 2024)

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Decline in fertility as being reported by world data is not only about infertility but because the population decides to stop having children. This reduced fertility is not just about one want and was not able to produce, instead the decline includes social factors. The social factors include---deliberates family planning, it is one of the factors in decrease in fertility. In this case the couple because of increase in cost of living [high cost of living] decides not to have, or to have one or two children and decided not to have again, the woman was on family planning for more than 12yrs, until the woman began to mount pressure on the man for the need of one more child, for all those years she was on fertility control drugs till on the thirteenth year, she had another child and went back on family planning; Another had two children and decided not to have again. This is in contrast to our mothers that had many children in their time and still cater for them easily, then having many children is a display of wealth.

Unintended pressure of work life is another factor that affects fertility from the Fig4, we found out that there is much decline in fertility in Nigeria. Considering high cost of living in the country; all work to earn a living. The pressure of work of both couple affects family much. Sometimes both may not see for somedays in a week due to the schedule of work eg. The mother is a nurse on night duty and the husband a lecturer may not see each other for weeks, all these are making efforts to make end meet. This is in contrast to our mothers, they were mainly housewives, they cook, take baths and wait for their husbands; They eat together and went to bed together. In Fig 4; there is reduced fertility birth in Nigeria, from about 6.4 birth in 1940 to 5.5 birth rate in 2023, the fertility reduction is worldwide.

2.2: Prevalence of DM in infertility in Nigeria

Men: The prevalence of diabetes mellitus in infertile men ranges from 0.71% to 1.41%, while the prevalence of infertile men ranges from 35% to 51% (Lotti,2023). The prevalence of male fertility decline is in parallel to DM emphasis on T2 NIDDM and some studies reported a strong association with obesity and male infertility (Graziani, 2024). It was stated that in a case control studies, compared semen samples of 27 diabetic (age 34±2) and 29 non-diabetic subject found lower semen volume and increase DNA [sperm]fragmentation rates among diabetic mellitus patients compared to the control (Graziani, 2024).

Studies on prevalence of infertility in DM partners of infertile couples revealed decline in the sperm motility and sperm morphology increased (Omolaoye, 2018). Women: The increasing incidence of PCOS is associated with the increasing in occurrence of resistance in insulin and glucose metabolism. PCOS is due to the increase production of androgen(hyperandrogenism) (Puwar, 2022). In a more study a UITH between 1 January 2011 and 31st dec 2013, out of 624 infertile women who presented at Assisted Reproductive Technology Centre and gynecology Unit ,76 women had PCOS, of prevalence rate of 12.2% (Omokanye,2015).

In a more recent study at Benin city Nigeria,421 consecutive infertile women of child bearing age 18- 45 years were used, 20.9% (88 women) had biochemical hyperandrogenism, 3.6% (15 women) presented with clinical hyperandrogenism. The prevalence of polycystic ovaries was 13.8%; the prevalence PCOS based on national health institute was 16.9% (71 women), Rotterdam 27.6% (116 women), 2006 Androgen excess society 20.7% [87 women], the prevalence of PCOS was high; in the above study women with PCOS were younger with higher testosterone level (Akpata, 2018)

2.2.1: Prevalence of DM

Diabetes has been considered one of the diseases that pose health threat as it affects 422 million adults of the world population in 2014 and a continuous rise in prevalence is expected (Lovic,2019). WHO in 2014 reported that 422 million people (8.5% of the population) had DM, compared with 108million (4.7%) in 1980 (WHO 2016). The World Health Organization previously projected the rise of DM cases to about 300 million by 2025 and 366million by 2030 from 171 million in 2000 (Animaw 2017). In 2023, 590 million people worldwide have diabetes, in 2025, International Diabetes Federation (IDF) reported that 11.1% or 1 in 9 of the adult population 20-79 are living with diabetes and projected 1 in 8, approximately 853 million prevalence of DM by 2050(International Diabetes Federation 2025). Type 2 DM accounts for 90%-95% of those with DM, the prevalence and incidence of type 2 DM is rapidly increasing throughout the world and is a contemporary disease because it is mostly caused by lifestyle factors (Omolaoye, 2018).

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In recent times, the prevalence of type 2 DM has increased among young men and women in childbearing age, which if not well managed or controlled, affects reproductive function leading to reduce fertility in both sexes (Magliano, 2020). Nigeria is the most populated country in Africa and has up to 4 million people with diabetes (Fasanmade 2015). 70% to 80% of the 4 million remains undiagnosed and untreated, this relatively large number poses great stress on the meager health budget in Nigeria, which results to many patients present to secondary and tertiary health care centers with advanced disease with high morbidity and mortality (Fasanmade, 2015).

According to the latest data by United Nations, it translates to 8.02 million Nigerian adults with diabetes; this prevalence of diabetes in Nigeria was almost two times higher than 3.6% estimate by the International Diabetes Federation in 2021; the prevalence of DM globally reached to 10.5% in 2021 according to the international Diabetes Federation, of these cases, 537 million adults live with diabetes, IDF predicts that by 2045, 784 million adults will have diabetes (Huigin, 2023).According to the American Diabetes Association, diabetes affects more than 30 million children and adults, more than 9% of the population in the United States of which 1.2million have the form of diabetes called type 1 and the remainder have type 2; one fourth of these individuals are currently unaware that they have hyperglycemia, approximately 1.5million new cases of adult diabetes are diagnosed each year in the United States (Kumar, 2021).

2.2.2: Prevalence of infertility in Nigeria

In a study at Lagos, the incidence rate of 26.8% was found higher than 10%-15% of couples in Southwestern Nigeria; also, higher than 10%-15% of couples in the western world that was reported to experience infertility (Adegbola, 2013). In a study in Enugu, the prevalence of infertility was 5.5 % of all outpatients in gynecologic consultations, unidentifiable cause 39% of cases, female factor 28.7% cases, male factor 11.5%, both male and female 20.4% cases, secondary infertility 76.8% and primary infertility 23.2% (Ugwu, 2012).

Table 1: Trends in children born per woman – Nigeria vs Africa

Year	Africa		Nigeria	
	Children	Decline	Children	Decline
2009	4.927	0.041	5.993	0.031

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2010	4.891	0.036	5.948	0.045
2011	4.842	0.049	5.893	0.055
2012	4.796	0.046	5.797	0.096
2013	4.740	0.056	5.694	0.103
2014	4.686	0.054	5.622	0.072
2015	4.625	0.061	5.503	0.119
2016	4.545	0.080	5.343	0.160
2017	4.482	0.063	5.182	0.161
2018	4.391	0.091	5.021	0.161
2019	4.312	0.079	4.861	0.160
2020	4.242	0.070	4.700	0.161
2021	4.179	0.063	4.636	0.064
2022	4.125	0.054	4.552	0.084
2023	4.072	0.053	4.482	0.070
Average	**4.524**	**0.061**	**5.282**	**0.108**

In another study where 314 couples were studied in Nnewi and Awka in southeastern Nigeria 204(65%) had primary infertility, 110(35 %) had secondary infertility, majority of the female patients 67% were between 25 and34 years, 65 (20.7%) couples had a combination of both male and female, unidentifiable case 35(11.1%) (Ikechebelu, 2003). Nigeria has a prevalence of infertility ranging from 14.5% to 30% (Daltijo, 2016). On review of the children born per woman in Nigeria relative to Africa; a steady but inconsistent rate of decline is observed (Tesfa,2023; The World Bank 2023). The average level and rate of decline in Nigeria are higher relative to the African continent (Table 1).

2.2.3: Prevalence of infertility in Delta state in Nigeria

A study found that the incidence of infertility in delta was 32 %, male factor 40.6 % the mean average age of 34 +_6years, 58.9%female factor (Odunvbun 2018). In a study in Asaba, estimation from demographic health survey found 11% prevalence rate, clinical base 14.5% and 30% (Esan, 2022)

According to the study on DM done at Novena University, the number of patients were 53,421. 19,391 (36.29%) were females, 18,559 (34.75%) males and 15,435 (28.95%) children; the overall prevalence of diabetes was 25.46% with the prevalence among males 46.63% and females 53.37%; the pattern of diabetes complications was kidney failure 27.87%, heart attack 27.27%, erectile dysfunctions (21.0%) which results to infertility and cardiovascular diseases (10%); however, it was also shown that infertility is one of the complications of DM (Agofure 2020).

3: Conclusion

Diabetes being a health disease condition has infertility as a complication. The prevalence of diabetes is of increase thereby affecting the prevalence of infertility. Studies on prevalence of infertility in DM partners of in fertile couples revealed decline in the sperm motility and sperm morphology increased. However, life style modifications like adequate diet, exercise and medical treatment can help in control of the glycemic level, thereby improving good health (Salama,2023). There is need for more studies to be done on the prevalence of DM on infertile couples for the increase in knowledge and awareness.

References

Adegbola O, Akindele O (2013). The pattern and challenges of infertility management in Lagos Nigeria. *Afr Health sci.* 13(4):1126-9. Dio:10.4314/ahs. v13i4.37

Agofure O, Okandeji-Barry OR, Ogbon, P (2020). Pattern of diabetes mellitus complications and co-morbidities in Ughelli LGA Delta State, Nigeria. *NJBCS* 17(2):123-127 Doi:10.4103/njbcs.37-18

Animaw W, Seyoum Y (2017). Increasing prevalence of diabetes mellitus in a developing country and its related factors. *Plos One*, 12(11), e0187670. https://doi.org/10.1371/journal.pone.0187670

Asiimwe S, Osingada C, Mbalinda S, Muyingo M, Ayebare E, Namutebi M, Muwanguzi P (2022). Women experience of living with involuntary childlessness in Uganda; a qualitative phenomenological study. *BMC Womens Health* 22(1):532. Doi:10.1186/s12905-022-02087-0

Boivin J, bunting L, Collins J, Nygren G (2007). International estimates of infertility prevalence and treatment -seeking; potential need and demand for infertility medical care. *Hum Reprod* 22(6):1506-12 Doi;10.1093/hum rep/dem 046

Condorelli RA, La Vignera S, Monglol LM, Alamo A, Calogero AE (2018). Diabetes mellitus and infertility: Different pathophysiological effects in type 1 and 2on sperm function. *Front endocrinol*,9,268. https://doi.org/10.3389/fendo.2018.00268

Cretu D, Cernea S, Onea CR, Pop RM (2020). Reproductive health in women with type 2 diabetes mellitus. *Hormones* (Athenenes,Greece).19(6):1-10. Doi:10.1007/s42000-020-00225-7

Daltijo M, Andreadis N, Aminu B, Umar N, Black K (2016); The prevalence and clinical pattern of infertility in Bauchi, northern Nigeria *Trop J obstet Gynaecol*,33(1),76-85 https://www.reseachgate.net

Dunson DB, Baird DD, Colombo B (2004). Increased infertility with age in men and women.*Obstet.Gynecol.*103(1)51-56Doi: 10.1097/01.AOG.0000100153.24061.45

Eijkemans M J, van Poppel F, Habbema, DF, Smith, K. R., Leridon, H, te Velde, E. R. (2014). Too old to have children? Lessons from natural fertilitypopulations.*HumReprod,29*(6),1304-1312. doi:10.1093/humrep/deu056

Esan D, Nnamani K, Ogunkorode A .Mohammad F,Oluwagbemi O,Ramos C(Esan 2022);Infertility affects the quality of life of south western Nigerian women and their partners. *Int J Afr Nurs Sci* 17(188):100506 Doi:10.1016/j.ijans.2022.100506

Fasanmade OA, Dagogo-Jack S (2015). Diabetes care in Nigeria. *Ann of Glob Health*. 81(6):821-829 https://doi:10.1016/j.aogh.2015. 12.012

Fatima W, Akhta A, Hanif A, Cilani A, Farooq S (2024). Comparison of baseline characteristic, sociodemographic and gynecological risk factors associated with secondary infertility of females in Pakistan. *Womens Health Rep* 5(1):340-345. Doi:10.1089/whr.2023.014.

Graziani A, Scafa R, Grande G, Ferlin A (2024). Diabetes and male fertility disorders. Molecular Aspects of Medicine.99,101303 https://doi.org/10.1016/j.mam.2024.101303

Guo H, Wu H, Li Z (2023). The pathogenesis of diabetes. *Int J Mol Sci*.**24**(8):69-78. Doi:10.3390/ijms.24086978

Hazlina N H, Norhayati MN, Bahari SS I, Arif NA, (2022). Worldwide prevalence, risk factors and psychological impact of infertility among women: a systemic review and meta-analysis. BMJ open,12(3), e057132. https://doi.org/10.1136/bmj open-2021-057132

Huang R, Chen J, Guo B, et al (2024). Diabetes induced male infertility: potential mechanisms and treatment options. Mol Med 30(11) https://doi.org/10.1186/s10020-023-00771-x

Ikechebelu JI, Adinma JI, Orie EF, Ikegwuonu SO (2003); High prevalence of male infertility in southeastern Nigeria. *J Obstet Gynaecol* doi;10.1080/01443610310001604475

International Diabetes Federation (IDF) (2025). Diabetes Atlas; Diabetes facts and figures. https://idf.org/

Kumar V, Abbas K.A,Aster CJ (2021) Robbins & cotran pathologic basis of disease. 10th ed. Philadelphia, (PA):Elsevier.

Leslie SW, Soon-Sutton TL, & Khan, M. A. B. (2024). *Male Infertility*. In S. [Internet](Ed.).https://www.ncbi.nlm.nih.gov/books/NBK562258/

Livshits A, Seidman D (2009): Fertility Issues in women with diabetes. *Womens Health*. 5(6):701-7, DOI:10.2217/whe.09.47

Lotti F. Maggi M. (2023). Effects of diabetes mellitus on sperm quality and fertility outcomes: Clinical evidence. *Andrology, 11*(2), 399-416. doi:https://doi.org/10.1111/andr.13342

Lovic D,Piperidou A, Zografou I, Grasssos(2019). The growing epidermic of diabetes mellitus . Current L Vascular Pharmacology, 17(2), Doi:10.2174/1570161117666190405165911

Magliano DJ, Sacre JW, Harding JL, Gregg EW, Zimmet PZ, Shaw JE (2020). Young-onset type 2 diabetes mellitus-implications for morbidity and mortality. Nat Rev Endocrinol 16(6), 321-331. https://doi.org/10.1038/s4157-020-0334-z

Maresch C, Stute D, Alves M, Oliveira P, Kreter D, Linn T (2018): Diabetes- induced hyperglycemia impairs male reproductive function: a systematic review. Hum Reprod Update .24(1):86-105. Doi:10.1093/humupd/dmx033

Moghaddam AD, Delpisheh A, Sayehmiri K (2016). An investigation of the worldwide prevalence of infertility as a systematic review. *Qom uni. Med Sci J* **10**(1):76-87 doi;10.1186/s12905-022-02087

Obeagu EI, Njar VE, Obeagu GU (2023). Infertility prevalence and consequence. *IJCRCPS 10(7:)43-45* Doi:10.22192/ijcrcps.2023

Odunvbun WO, Oziga DV, Oyeye LO, Ojeogwo CLL (2018); Pattern of infidelity among infertile couple in a secondary health facility in Delta State, South South Nigeria. *Trop J Obstet gynaecol* 35(3):244 Doi: 10.4103/TJOG.TJOG-61-18

Office of Communications. (2021). How common is male infertility, and what are its causes? retrieved from https://www.nichd.nih.gov/health/topics/menshealth/conditioninfo/infertility

Omokanye LO, Ibiwoye-Jaiyeola OA, Olatinwo WO, Abdul IF, Durowade KA, Biliaminu SA (2018). Polycystic Ovarian Syndrome: Analysis of Management Outcomes among infertile women at a public health Institution in Nigeria. Nigeria Journal of General Practice .13(2)116-1213. https://doi.org/10.60787/njgp.v13i2.149

Omolaoye TS, du Plessis SS (2018). Diabetes mellitus and male infertility. Asian Pacific J Reprod 7(1):6-14 Doi:10.4103/2305-0500.220978

Purwar A, Nagpure S, (2022). Insulin resistance in polycystic ovarian Syndrome. *Cureus 14(10): e30351 Doi;10.10.7759/cureus.30351*

Roser, M. (2014). The global decline of the fertility rate" Published online at OurWorldinData.org. 'https://ourworldindata.org/global-decline-fertility-rate' [Online Resource].

Salama I I, Sami SM, Salma SI, Abdel-Latif G A, Aboulghate A, Raslan HM, Mohsen A, Rasmy H, Ibrahim MH, Ganem MM, Abdelmohsen AM, El-Etreby L A, Ibrahim NA, Fouad WA, El-Deeb SE (2023). Impact of lifestyle modification on glycemic control and cognitive function among type 2 diabetes mellitus patients. *Future Sci OA,* 9(1), FS0835.https://doi.org/10.2144/fsoa-2022-0060

Sapra A, Bhandari P (2023): Diabetes mellites. In: StatPearls (Internet.) https://www.ncbi.nlm.nih.gov/books/NBK553501/

Tesfa D, Tiruneh SA, Gebremariam AD, Azanaw MM, Engidaw MT, Kefale B, Abebe B, Dessalegn T, Tiruneh M (2023). The pooled estimate of the total fertility rate in sub-saharan Africa using recent (2010-2018) Demographic and health survey data. *Frontiers in public health*,10, 1053302. https://doi.org/10.3389/fpubh.2022.1053302

Ugwu EO, Onwuka CI, Okezie OA, (2012); Pattern and outcome of infertility in Enugu; the need to improve facilities and approaches to management. *Niger J Med* 21(2): 180-4 Doi:10.4314/NJM.V2112

UN WPP. (2024). Fertility rate: births per woman – HFD, UN WPP – periodborn per woman tables Retrieved from infertile couple in a secondary health facility

Zaimi M, Michalopoulou O, Stefanaki K, Kazakou P, Vasileiou V, Psaltopoulou T, Karagiannakis DS, Paschou SA (2024). Gonadal dysfuntion in women with diabetes mellitus.Endocrine. *Epub* 85(2):461-472.Doi:10.1007/s12020-024-03729-z

World Bank Data base (2023). The Nigeria fertility rate-data chart-The global economy. Fertility rate ,births per woman. Data avaiability 1960-2023.

World Health Organisation (2016). World Health Day 2016: Beat diabetes. https://www.who.int/news-room/events/detail/2016/04/07/default-calendar/world-health-day-2016

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