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Cervical Abnormalities are related to Infertility: A Review

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ABSTRACT: Infertility is a disease and cervical abnormalities of the genital tract in females may cause this condition. To evaluate the cervical abnormalities related to infertility in females a systematic review was done. Related literature were collected via Google Scholar, NCBI, PubMed, and Medscape. For article searching following keywords were used: cervical abnormalities, infertility, uterine anomalies, and cervical factors. As the literature reviewed, more than 60 articles were studied, from which only 45 articles were added. The study suggested that many cervical abnormalities affect fertility including the poor interaction of mucus and sperm in the cervix, cervical cancer, dilatation and stenosis of the cervix, wall irregularities, diverticulum, masses, and metaplasia of the cervix. Some of the microorganisms also affect cervical functions causing infertility. It is concluded that cervical abnormalities can be related to infertility.

Keyword: Cervical abnormalities, infertility, uterine abnormalities, cervical factors

INTRODUCTION

Infertility is described as a disease in which failure of getting pregnant is noted after unprotected regular intercourse for a couple of months

(Shahzad et al., 2022). Normally, the term infertility is given to the couple for unsuccessful sex cycles after unprotected and regular intercourse (Wilcox et al., 2010). Some couples

take proper treatment to be pregnant, but they did not conceive, and some couples conceive naturally but late. There are two basic types of infertility including primary and secondary infertility. Infertility involved the genital organs of both males and females (John et al., 2022; Noor et al., 2021). Evaluation of infertility in females is necessary including uterotubal factor, ovulatory factor, and male factor (Carson et al., 2021).

Cervical Abnormalities

The cervix performs an intriguing gatekeeping function by first blocking infections from the vagina from ascending into the uterus and then by permitting sperm to ascend to the Fallopian tubes (Martyn et al., 2014). Additionally, it is essential for preserving the pregnancy in the uterus until labor starts. One of the important roles played by the female reproductive anatomy in fertilization includes the cervix because it involves the transportation of the sperms actively within the uterus (Elad et al., 2020). Any abnormality in the cervix

can be related to infertility. In normal reproductive-age women, the mucus of the cervix is produced at the rate of 20 to 60mg/day and in the pre-ovulatory phase, this rate increases up to 700mg/day (Schmidt et al., 2013). This mucus of the cervix acts as a barrier for abnormal sperm. It contains secretions in small amounts of tubes, endometrium, and follicles. The unavailability of mucus can be the cause of infertility. More than a 200million sperms are deposited in the vaginal canal, of which only hundreds of sperms can reach the ovum (Mortimer et al., 2022; Swan et al., 2022). Little modification in the mucus can change the cervix structure which can lead to infertility and failure of natural pregnancy (Moghissi et al., 1972; Nakano et al., 2015). The diagnosis and treatment of cervical mucus abnormalities can lead to natural fertility. Different modalities are used to diagnose infertility including pelvic ultrasound, and MRI (Medicine et al., 2015). The test used for diagnosis involves an ultrasound

and postictal test (PCT), a valuable tool that can diagnose the cause of infertility in women. The treatment involves clomiphene therapy, which is the most common (Bloom et al., 2012; Boursicot et al., 2010; Check et al., 2021).

Microorganisms Causing Infertility

Some of the microorganisms including *Escherichia Coli*, *Pseudomonas aeruginosa*, and *Bacillus subtilis* can affect cervical functions (Kaur et al., 1986). The early assessment of cervical or vaginal microflora can be useful in treating the cause of infertility and can enhance the chance of therapeutic protocols (Campisciano et al., 2017). The diagnosis can be achieved by laboratory tests including semen analysis, serum progesterone levels, and hormone levels in both genders (Makar et al., 2002). In infertility, the cervical factor counts for approximately 5% of all females (Assefa et al., 2019). The abnormalities of the cervix can be congenital and can be acquired in different females. Stenosis of the

cervical canal involving internal os can lead to infertility (Zafarani et al., 2015). The stenosis can be due to polyp or endometriosis in the cervix. The early assessment of the stenosis can be useful for the therapeutic process of infertility (Moramazi et al., 2018).

Diagnosis of Cervical Abnormality

Another abnormality of the cervix that can affect fertility is the cervical collecting diverticulum, mostly it is congenital (Tanaka et al., 2020; Zafarani et al., 2015). The diagnosis can be via ultrasound, MRI, and hysterosalpingography (HSG) while its effective treatments include ovulation induction and ultrasound-guided intrauterine insemination (Carson et al., 2021; Sehring et al., 2021). HSG is an effective and less invasive tool to evaluate female reproductive organs. It is most widely used to rule out causes of infertility in females (Bajpai et al., 2014). It can easily detect cervical abnormalities including dilatation, stenosis, wall irregularities, diverticulum, and extra masses (Seoud

et al., 2002; Zafarani et al., 2015). One of the causes of cervical abnormalities leading to infertility is cancer of the cervix. In developing countries, it is very common to be affected by cervical cancer. Its etiology involves the Human papillomavirus (HPV) which can be spread sexually (Faridi et al., 2011; Jalil et al., 2020). The best method to diagnose this is screening. It can seriously affect fertility therefore there is a need for a cervical smear test for avoiding it actively (Nnadi et al., 2014). Trichomoniasis is another common cause of infertility. It is a sexually transmitted disease that occurs due to Trichomoniasis, a parasite (Menezes et al., 2016). The invasion of this parasite can lead to chromosomal modifications and causes cervical abnormalities. Females, positive with this parasite in the cervix

remained infertile (Merdaw et al., 2018).

Epidemiology of Cervical Abnormalities

Worldwide, infertility may affect a couple of reproductive ages more commonly. Infertility affects 15% to 20% of American couples overall, with older couples experiencing higher rates. In Pakistan, 22% of women come to clinics due to the problem of infertility. The average age of most females is 29 years (Poon et al., 1985). Usually, at a yearly well-women screening, the female partner first seeks treatment for an infertility issue. This study will help a general practitioner to start the diagnostic examination and treat several infertility-related conditions.

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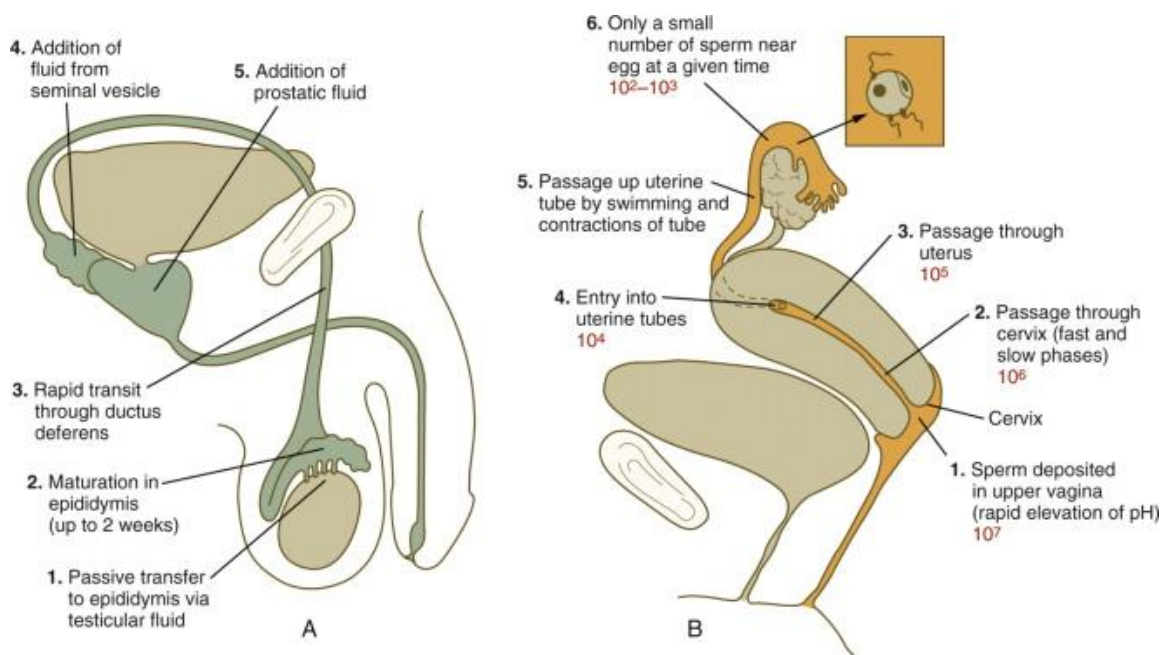


Fig. 1. Sperm transport in (a) the male and (b) the female reproductive tracts (Carlson, 2018)

METHODOLOGY

A literature review of 49 articles was performed with the use of search engines. The search engines that were taken for the study were Google scholar, NCBI, PubMed, and Medscape. The keywords that were used for searching were cervical abnormalities, infertility, uterine abnormalities, and cervical factors. Extraction of data is completely done from journal articles. As the literature reviewed, more than 60 articles were

studied, and only 49 articles were added in this study that concluded cervical abnormalities are related to infertility.

Poor interaction of mucus and sperm affects Fertility

Fertility can be affected by the poor interaction of mucus and sperm in the cervix thus, the unavailability of cervical mucus can be the cause of infertility. One of the causes of cervical abnormalities leading to infertility is cancer of the cervix. The

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dilatation and stenosis of the cervix, wall irregularities, diverticulum, and extra masses are the causes of cervical abnormality leading to infertility. Tissue metaplasia of the cervix can lead to infertility in females.

The known cause of infertility can be the poor interaction of mucus and sperm. The increased rate of pregnancy in females is related to the mucus of the cervix. A low amount of cervical mucus indicates a low rate of sperm transportation and low ovum quality to fertilize (Fig. 1). Martyn et al. reviewed the cervix's function in fertility, published in 2014, and concluded with similar findings that fertility can be affected by the poor interaction of mucus and sperm in the cervix (Kyrgiou et al., 2014). Therefore, ovulation induction and intrauterine inseminations (IUI) both should be used to increase the rate of pregnancy in females having a low amount of cervical mucus (Farhi et al., 1995). This is an effective treatment and is very useful as stated by Soheila Akbar *et.al* study published in 2012.

Couples who wanted to conceive should perform IUI with the husband's semen. It can also be performed in females with less infertility duration. This is a useful procedure in young females of an average age of fewer than 30 years (Zadehmodarres et al., 2009).

Certain microbes may have an impact on cervical function. Early detection of cervical microflora can help with therapy procedures and in treating the underlying cause of infertility. Laboratory testing can be used to make the diagnosis (Brouwer et al., 2010). Elevated cervical levels of IL-1 and IL-8 can cause bacterial vaginosis (BV) that can affect fertility in females as stated by P Mastromarino *et.al* study's published in 2014 (Spandorfer et al., 2001). A prospective study was conducted in a University hospital to rule out the effect of preoperative and postoperative effects of the septate uterus, and the duplicate uterus on infertility (Valle et al., 2013). It was concluded that the spare of the duplicate cervix and hysteroscopic

septum resection (HSR) can lead to the increased thickness of the internal OS of the cervix causing cervical stenosis and further leading to infertility (Wang et al., 2009). Cervical collecting diverticulums are another malformation of the cervix that may have an impact on fertility. Hysterosalpingography, MRI, and ultrasound can all be used to make the diagnosis (HSG) as stated by NJ Khati et al in their study published in 2012. Osseous metaplasia of the cervix can lead to infertility in females. Deep osseous metaplasia in the cervix can cause uterine perforations to become a major cause of infertility. It can be diagnosed by using TVS (transvaginal ultrasonography). Therapeutic processes may include laparotomy and hysterectomy (Polat et al., 2011).

Cervical Cell Lesions and Infertility

The causes that are seen in females are mostly cervical cell lesions that are causing infertility. The PAP smear is performed that is more sensitive for this purpose. Precancerous lesions can also cause infertility (Sachan et al.,

2018). According to the National Cancer Registry (NCR) of Norway, a study concluded that precancerous lesions in the fallopian tubes, uterus, and cervix can cause infertility (Holst et al., 1983). Sexually transmitted diseases including cervical cancer are more common to cause infertility in females. A cross-sectional study was performed in Nigeria concluding that epithelial cell abnormalities in the cervix lead to infertility but infertility itself did not increase the rate of cervical changes in the females (Mbazor et al., 2011). Infertility can be of unknown cause which is called unexplained infertility. In this type, the cause of infertility cannot be detected in both males and females. But searches are being performed to know the relation between cervical abnormalities with unexplained infertility (Prabha et al., 2011).

CONCLUSION

It was concluded from the review study that different cervical abnormalities are related to infertility in females.

CONFLICT OF INTEREST

Authors declared there is no conflict of interest.

REFERENCES

1. Assefa AA, Astawesegn FH, Eshetu B (2019). Cervical cancer screening service utilization and associated factors among HIV positive women attending adult ART clinic in public health facilities, Hawassa town, Ethiopia: a cross-sectional study. *BioMed Cent.* 19 (1): 1-11.
2. Bajpai T, Bhatambare G, Shrivastava G (2014). Simple non-invasive and cost-effective method for detection of *Chlamydia trachomatis* infection (a silent, sexually transmitted pathogen that can cause infertility). *Int. J. Health Allied Sci.* 3 (1): 66.
3. Bloom S, Webster G, Marks D (2012). *Oxford handbook of gastroenterology and hepatology*: Oxford university press.
4. Boursicot K, Sales D (2010). *Clinical Specialties*: Oxford University Press.
5. Brouwer MC, Tunkel AR, Van de Beek D (2010). Epidemiology, diagnosis, and antimicrobial treatment of acute bacterial meningitis. *Clin. Microbiol. Rev.* 23 (3): 467-492.
6. Campisciano G, Florian F, D'Eustacchio A (2017). Subclinical alteration of the cervical–vaginal microbiome in women with idiopathic infertility. *J. Cell. Physiol.*, 232 (7): 1681-1688.
7. Carlson BM (2018). *Human embryology and developmental biology*. Elsev. Health Sci.
8. Carson SA, Kallen AN (2021). Diagnosis and management of infertility: a review. *Jama.* 326 (1): 65-76.
9. Check J (2021). Diagnosis and treatment of cervical mucus abnormalities. *CEOG.* 33 (3): 140-142.

Cervical Abnormalities and Infertility: A Review

10. Elad D, Jaffa, AJ, Grisaru D (2020). Biomechanics of early life in the female reproductive tract. *Physiol.* 35 (2): 134-143.
11. Farhi J, Valentine A, Bahadur G (1995). In-vitro cervical mucus—sperm penetration tests and outcome of infertility treatments in couples with repeatedly negative post-coital tests. *Hum. Reprod.* 10 (1): 85-90.
12. Faridi R, Zahra A, Khan K (2011). Oncogenic potential of Human Papillomavirus (HPV) and its relation with cervical cancer. *Virolog. J.* 8 (1): 1-8.
13. Holst, N, & Abyholm T (1983). Precancerous lesions of the cervix uteri in infertile women. *Br Med J (Clin Res Ed)*, 287 (6398), 1019-1020.
14. Jalil AT, & Karevskiy A (2020). The cervical cancer (CC) epidemiology and human papillomavirus (HPV) in the middle east. *Int. J. Environ. Eng.* 2 (2): 7-12.
15. John A, Faridi TA (2022). Awareness and Knowledge of Human Immunodeficiency Virus Transmission and Prevention from Mother to Child: A Cross-Sectional Study among Female Sex Workers: HIV Transmission and Prevention from Mother to Child. *PBMJ*: 54-58.
16. KAUR M, Tripathi K, Bansal M (1986). Bacteriology of cervix in cases of infertility: effect on human sperm. *Am. J. Reprod.* 12(1): 21-24.
17. Kyrgiou M, Mitra A, Arbyn M, (2014). Fertility and early pregnancy outcomes after treatment for cervical intraepithelial neoplasia: systematic review and meta-analysis. *Bmj.* 349.
18. Makar RS, Toth TL (2002). The evaluation of infertility. *Pathol. Patterns Rev.* 117(1): S95-S103.
19. Martyn F, mcauliffe F, & Wingfield M (2014). The role of the cervix in fertility: is it time

Cervical Abnormalities and Infertility: A Review

- for a reappraisal? *Hum. Reprod.* 29 (10): 2092-2098.
20. Mbazor J, Umeora O, Egwuatu V.(2011). Cervical cytology profile of infertility patients in Abakaliki, South-eastern Nigeria. *BJOG.* 31 (2): 173-177.
21. Medicine PCOTASFR (2015). Diagnostic evaluation of the infertile female: a committee opinion. *Fertil. Steril.* 103(6): e44-e50.
22. Menezes CB, Frasson AP, & Tasca T (2016). Trichomoniasis-are we giving the deserved attention to the most common non-viral sexually transmitted disease worldwide? *Cell. Microbiol.* 3 (9): 404.
23. Merdaw M, Kadhim HS, Abd alsattar Alriyahee F (2018). Genetic variation of *Trichomonas vaginalis* isolates from Iraqi Women: Association with fertility and cervical abnormalities. *JUBPAS.* 26 (7): 321-338.
24. Moghissi KS (1972) The function of the cervix in fertility. *Fertil. Steril.* 23(4): 295-306.
25. Moghissi KS (1987). Cervical and uterine factors in infertility. *Obstet. Gynecol. Clin. North Am.* 14(4): 887-904.
26. Moramazi F, Roohipoor M & Najafian M (2018). Association between internal cervical os stenosis and other female infertility risk factors. *Middle East Fertil. Soc. J.* 23(4): 297-299.
27. Mortimer D, Björndahl L, Barratt CL (2022). *A practical guide to basic laboratory andrology: Cambridge University Press.*
28. Nakano FY, Leão, RD (2015). Insights into the role of cervical mucus and vaginal pH in unexplained infertility. *Medicalexpress*, 2.

Cervical Abnormalities and Infertility: A Review

29. Nnadi D, Nwobodo E, Ekele B (2014). Screening for cervical cancer: A review of outcome among infertile women in a tertiary hospital in North-West Nigeria. *Ann. Med. Health Sci. Res.* 4 (3): 383-387.
30. Noor S, Rana MS, Hanif A (2021). Determinants of Lack of Family Planning in Grand Multiparous Women: Lack of Family Planning in Grand Multiparous Women. *PBMJ*, 4 (1).
31. Polat I, Sahin O, Yildirim G (2011). Osseous metaplasia of the cervix and endometrium: a case of secondary infertility. *Fertil. Steril.* 95 (7): 2434. E2431-2434. E2434.
32. Poon WW, Mccoshen JA (1985). Variances in mucus architecture as a cause of cervical factor infertility. *Fertil. Steril.* 44(3): 361-365.
33. Prabha V, Aanam TD, Kaur S (2011). Bacteriological study of the cervix of females suffering from unexplained infertility. *Am. J. Biomed. Sci.*, 3(2).
34. Sachan PL, Singh MPatel, ML (2018). A study on cervical cancer screening using pap smear test and clinical correlation. *Asia-Pac. J. Oncol. Nurs.* 5 (3): 337-341.
35. Schmidt CL (2013). In vitro fertilization. *Human in Vitro Fertilization and Embryo Transfer.* 59.
36. Sehring J, Hussain A, Beltsos, A, (2021). Role of Imaging in the Management of Female Infertility Breast Gynecological Diseases (pp. 441-463): Springer.
37. Seoud M, Awwad J, Adra A, (2002). Primary infertility associated with isolated cervical collecting diverticulum. *Fertil. Steril.* 77(1): 179-182.
38. Shahzad H, John A, Ali A (2022). Incidence of infertility in females and Evaluation of its Causes Using Ultrasonography: Incidence and Causes of

Cervical Abnormalities and Infertility: A Review

- Infertility in Females. *PBMJ*, 55-58.
39. Spandorfer SD, Neuer A, Giraldo PC (2001). Relationship of abnormal vaginal flora, proinflammatory cytokines and idiopathic infertility in women undergoing IVF. *J. Reprod. Med.* 46 (9): 806-810.
40. Swan SH, Colino S (2022). Count down: How our modern world is threatening sperm counts, altering male and female reproductive development, and imperiling the future of the human race: Simon and Schuster.
41. Tanaka K, Shiga N, Kuno T, (2020). Successful pregnancy and vaginal delivery after laparoscopic excision of a congenital uterine cervical diverticulum: A case report. *J. Obstet. Gynaecol.* 46(8): 1460-1464.
42. Valle RF, Ekpo GE (2013). Hysteroscopic metroplasty for the septate uterus: review and meta-analysis. *J. Minim. Invasive Gynecol.* 20 (1): 22-42.
43. Wang JH, Kai-Hong, X Lin J (2009). Hysteroscopic septum resection of complete septate uterus with cervical duplication, sparing the double cervix in patients with recurrent spontaneous abortions or infertility. *Fertil. Steril.* 91 (6): 2643-2649.
44. Wilcox AJ (2010). Fertility and pregnancy: an epidemiologic perspective: Oxford University Press.
45. Zadehmodarres S, Oladi B, Saeedi S (2009). Intrauterine insemination with husband semen: an evaluation of pregnancy rate and factors affecting outcome. *J. Assist. Reprod. Genet.* 26(1): 7-11.
46. Zafarani F, Ahmadi F, Shahrzad G (2015). Hysterosalpingographic features of cervical abnormalities: acquired structural anomalies. *Brit. J. Radiol.* 88(1052): 20150045.
47. Bruce M. Carlson MD, PhD, in *The Human Body*. 2019
48. Krysiewicz S (1992). An overview. *AJR* 50(5): 314-319.