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Non-Communicable Diseases (NCDs) in Mothers and Negative Outcomes of Pregnancy: A Narrative Review

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Abstract:

Non-communicable diseases (NCDs) lead to 74% fatalities worldwide including disproportionate impact on the low and middle-income nations including Pakistan. With a population of 255 million, Pakistan ranks as the fifth most populous country globally, where 64% of the people reside in rural areas. In Pakistan, the swift increase in premature deaths poses a significant threat. Even though there have been worldwide advancements in maternal and newborn health (MNH), the rates of maternal, fetal, and newborn mortality in Pakistan continue to be unchanged. Despite having a detailed National Action Plan, there have been no significant policy-level advancements to address this issue.

NCDs elevate the risk of negative pregnancy results such as preterm deliveries, caesarean deliveries, and low weight at birth, which result in detrimental effects on the mother, the child, as well as the future generations health across generations, stemming from negative pregnancy results that greatly heighten the likelihood of adult offspring developing NCDs. In developing countries such as Pakistan, diseases that result in negative pregnancy outcomes and endanger the health of future generations represent not only a health threat but also an economic one. The long-term consequences of these effects can diminish the nation's overall productivity.

A comprehensive literature search was conducted on PubMed and Google Scholar. Reports from the W.H.O, various national and international organizations were also examined. Common non-communicable diseases (NCDs) were identified, and the prevalence of major diseases which include diabetes, obesity, cardiac diseases, hypertension, diseases of the respiratory tract among mothers was examined, along with their effects on newborns. Further investigation is needed regarding the evaluation of long-term effects of maternal NCDs on the children born to these mothers to identify potential mechanisms and pharmacological treatments for managing or preventing maternal NCDs. In order to identify specific risk factors linked to these NCDs and prioritize intervention areas, it is essential to conduct a thorough nationwide study.

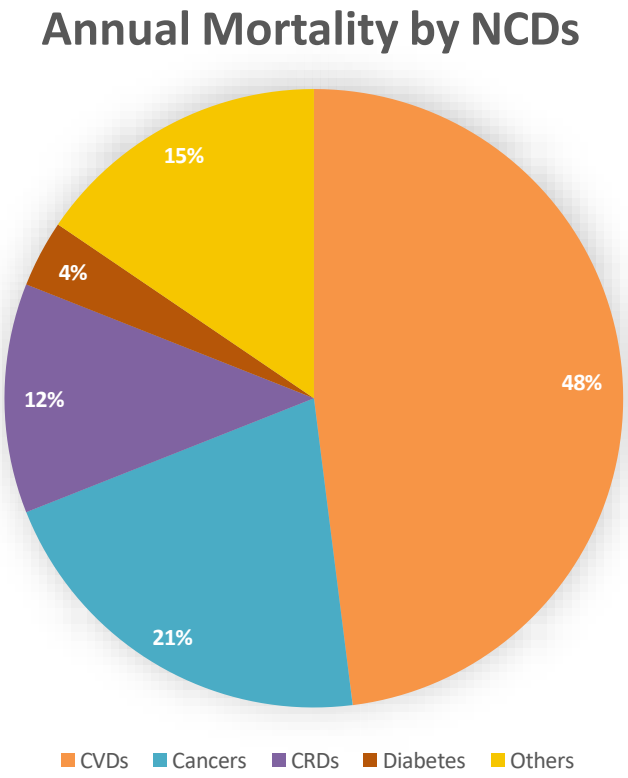
Keywords: Non-communicable diseases in Pakistan, maternal health, maternal obesity, maternal non-communicable diseases, fetal outcomes.

Introduction:

Disease has been the companion of human beings and humanity since the beginning. As civilization has transitioned and changed, it has evolved in various forms. The world has long been addressing the threat of communicable diseases, but the last century has seen a shift in the disease shift from communicable diseases to non-communicable diseases (NCDs).

NCDs were responsible for over 38 million deaths in 2012, which represented 68% of all deaths worldwide [1].

Noncommunicable diseases (NCDs), also known as chronic diseases, cannot be transmitted between individuals. They last for a long time and tend to develop gradually [2]. The primary causes of death among NCDs are diabetes (3.5%), chronic respiratory diseases (12%), cancers (21%) and cardiovascular diseases (48%). These four categories are estimated to account for 82% of deaths caused by NCDs. [3].



The NCD pandemic keeps expanding. In 2005, it was estimated that non-communicable diseases (NCDs) caused 35 million deaths, accounting for sixty percent of all fatalities worldwide. Out of which, 80% took place in countries with low and medium income, and around 16 million people younger than 70. It is anticipated that the overall number of fatalities due to NCDs will rise by an additional 17% over the coming decade [4].

Understanding the potential factors that lead to these diseases indicates the following percentages of these diseases are preventable cancers (40%), heart defects (80%) and type II diabetes (80%). In 20 years, it is projected that NCDs will account for nearly 50% of the global disease burden in developing and newly industrialized nations [4].

Risk factors like use of alcohol and tobacco, inadequate diet, and absence of exercise significantly contribute to the onset of NCDs. They are usually started in youth, carried on into adulthood, and their effects worsen with age. Conditions that are economic, environmental, and political lead to NCDs [4].

The occurrence of Non-Communicable Diseases (NCDs) is reported to be rising in developing countries, even though resources for addressing their aftermath are not easily accessible. This creates a burden socioeconomically and intensifies the deterioration of health indicators. NCDs are responsible for almost 36 million deaths each year with almost 80% in countries with low and medium income [5,6,7].

Pakistan is a country with swiftly increasing population. The rise in population, shifts among dietary habits, and decrease in physical activity are contributing to a growing number of modifiable risk factors for NCDs among the Pakistani populace. As a result, Pakistan is facing

twice the disease burden because of the increase in NCDs alongside communicable diseases that are already prevalent. This is clear from data on the global disease burden, which shows that in Pakistan, 77% of age-standardized deaths and 62% of crude deaths are attributable to NCDs and injuries [8].

Research has discovered a substantial load of NCDs in urban [9] and suburban regions [10] of Pakistan. In Karachi, a mega city in South Asia, 8% of the populace suffers from diabetes and 18% from hypertension. Additionally, it has been established that 39% of the population are pre-hypertensive and 40% are pre-diabetic, stressing that the burden will escalate even more [9].

A survey involving 12,000 households found that nearly 39% showed signs of hypertension plus diabetes was seen in 15% [10]. A study concentrating on the women population of Bhimber discovered, 6% of females in this population have a non-communicable disease (NCD [11].

Prevalence of Maternal NCDs and Adverse Pregnancy Outcomes in Pakistan:

Pakistan's pregnancy outcomes rank among the poorest globally, with rates that are much worse than those of many other developing countries. Although the death rates of mothers and neonates in Pakistan have declined, the improvement is not as significant as that observed in other South Asian countries [12-14].

In Pakistan, stillbirth rates have seldom been discussed and are underreported; they are approximately equal to the number of neonatal deaths. Approximately 5.5 million births occurred in Pakistan in 2015 [15]. In 2015, Pakistan's rate of maternal deaths was 178 fatalities for every 100,000 deliveries, reflecting a decrease of 58.7% from 431 fatalities 100,000 deliveries in 1990 [12].

The total neonatal deaths in Pakistan as of 2015 were 44 fatalities for every 1,000 newborns. Among the rural regions, neonatal deaths were noted to be 62 fatalities for every 1,000 newborns, whereas in wealthiest families, 34 fatalities for every 1,000 newborns [16, 17]. According to reports, the stillbirth rate in 2015 was 43 for every 1,000 newborns [17]. The neonatal deaths as per the 2017–2018 Pakistan Demographic Health Survey (PDHS) was 42 for every 1,000 newborns [18]. However, these figures can be believed to be the ideal approximations, while actual count of fatalities are probably unreported.

A majority of these negative pregnancy outcomes are linked to diseases in mothers including:

Diabetes:

Infant of a diabetic mother (IDM) refers to a neonate born to a mother with diabetes mellitus, specifically one whose blood sugar levels were consistently high during pregnancy [19]. Diabetes complicates approximately 3–10% of all pregnancies [20, 21]. Compared to infants of non-diabetic women, those infants of diabetic women have a heightened risk [22, 23]. Fetuses of mothers with diabetes have a higher risk of perinatal mortality and morbidity [24]. The precise mechanism by which maternal diabetes causes teratogenic effects is not completely understood and is probably multifactorial [25, 26].

Gestational diabetes mellitus (GDM) refers to a glucose intolerance identified during pregnancy [27]. It affects nearly 15% of women globally, as they experience hyperglycemia during pregnancy [28]. The onset is linked to morbidity and mortality rates concerning mothers, neonates, and fetuses. GDM poses a potential danger to the health of mothers and children in Pakistan. [29].

Gestational diabetes can adversely affect pregnancy outcomes, leading to issues like birth trauma, macrosomia (with a 14% absolute risk) and elevated cesarean section rates (with a 10% absolute risk). The measurements of these outcomes may vary based on factors such as screening methods and population characteristics, groups of individuals, as well as diagnostic standards [30].

Congenital cardiovascular defects constitute one of the common categories of birth anomalies, affecting approximately 6–8 infants per 1000 live births. The cause is generally unknown, but some are genetic and a few have an ecological cause. Roughly 1% of these cases can be attributed to a maternal illness [31]. In IDM infants, the occurrence of it rounds to roughly 5%. [32].

Various studies reveal the association between diabetes in mothers and birth defects in infants. Research carried out at Ayub Medical College, Abbottabad has revealed that the occurrence of heart defects among infants born to diabetic mothers is 43 (38.74%) [33].

A different study found that, among 101 neonates born to mothers with diabetes, maximum about 52.5% were diagnosed with heart defects, while the remaining 47.5% reported fit following tests. Thus, in this research, the occurrence of heart defects among neonates of diabetic mothers was 52.5% [34]. A local study carried out in Lahore found that, among 1530 registered newborns at full-term, 84 (6%) were born to mothers with diabetes. Birth defects were observed in 11 (13%) of them, with most of these cases involving heart defects [35].

Thus, keeping GDM strictly controlled during pregnancy can prove to be the key factor in significantly decreasing complications associated with GDM. It is recommended that all patients be tested for GDM, as even mild cases can greatly affect fetuses and the outcomes for pregnant women [36]. It is also advised to use screening echocardiography for the early diagnosis of CHD in order to reduce morbidity and mortality [37].

Obesity:

Obesity is characterized by an excessive buildup of body fat. These conditions are caused by various factors including genetic, environmental, cultural and metabolic factors. Due to the rising rates of obesity among women of reproductive age, it has become a global pandemic issue that could have detrimental effects on mothers and fetuses. It plays a part in the annual figures for certain types of avoidable deaths [38,39].

Obesity in females is escalating to epidemic levels, resulting in negative perinatal outcomes and a range of pregnancy complications. Women with obesity who are pregnant present risks for both maternal and child health concerning various complications [40]. It has been linked to various difficulties for mothers and their unborn children alike. Maternal obesity, characterized by a body mass index (BMI) of 30 or more, affects about 20% of mothers-to-be worldwide [41].

Obese women during pregnancy are at a heightened risk of gestational diabetes mellitus, hypertensive disorders like preeclampsia, complications during fetal development, and an increased likelihood of requiring a cesarean section. These conditions significantly threaten maternal health and increase the likelihood of adverse effects on the infant [42].

Research revealed that nearly 50% (47.2%) of women with excess weight and over 50% (56.0%) of women with obesity encountered a negative maternal outcome [43]. In terms of fetal outcome, stillbirths, premature deaths, along with admissions in the NICU were prevalent among expectant mothers with excess weight than in the control group. The most frequent disease in newborns observed was the NICU admissions with stillbirth following [44].

Consequently, even moderate overweight can significantly harm pregnancy outcomes, while obesity results in serious complications for both mother and fetus. Appropriate multidisciplinary management could mitigate the impact of obesity on the rates of disease and death among mothers and fetuses [44].

Cardiovascular Diseases (CVDs):

Cardiac diseases complicate approximately 1-4% of pregnancies. Due to advancements in medical sciences, there is an increase in the reporting patients with heart problems while expecting a child due to enhanced management. Nevertheless, in spite of all the progress made,

cardiac disease during pregnancy ranks as the second most common non-direct cause of maternal death globally, following suicide. It accounts for 10-25% of maternal deaths [45,46]. In pregnant women with heart disease, the maternal complications are divided as cardiac and non-cardiac complications. Cardiac complications are death due to cardiac disease, pulmonary edema, and congestive cardiac failure. and Some of the obstetrical complications that occur more frequently in cardiac patients include induction of labor, instrumental deliveries to shorten the second stage of labor, and postpartum hemorrhage [47].

The most frequent fetal complications are preterm birth and intrauterine growth restriction. In most cases, preterm delivery is caused by medical intervention. Prematurity and fetal growth restriction lead to rise perinatal morbidity and mortality. In cardiac patients, adverse neonatal outcomes occur in 20 to 30% of cases [48].

According to a study, signs of intrauterine growth restriction (IUGR) were observed in a quarter of the neonates, and nearly half of them were born preterm (before 37 weeks). Pregnancies complicated by maternal cardiac illness carry a considerable burden of fetal issues, with stillbirths occurring in 8.54% of cases and 25.61% of NICU admissions [49].

Thus, the most frequent cause of maternal mortality are cardiac diseases. Although certain fatalities cannot be prevented, it is crucial that females suffering from heart problems receive pre-pregnancy counseling. This type of counseling should be regarded as a fundamental aspect of clinical practice. It is essential that all cardiologists acknowledge the necessity of addressing pregnancy with females of reproductive age. Though females suffering from heart problems are susceptible to problems when carrying a baby, most will achieve a good outcome with careful management [50].

Hypertension:

Hypertension, which is characterized by a resting blood pressure greater than 140/90 mmHg on at least three measurements taken 24 hours apart, poses a considerable health risk during pregnancy. When a pregnant woman's blood pressure exceeds this threshold after the 20-week mark in her pregnancy, and she has no previous history of high blood pressure, it is diagnosed as pregnancy-induced hypertension [51]. In Pakistan, every hour, three women lose their lives because of complications linked to pregnancy and childbirth. Hypertensive disorders related to pregnancy occur in 6% to 8% of all pregnancies [52]. They are deemed a major factor contributing to negative maternal and fetal outcomes worldwide, particularly in developing regions [53].

According to one study, the rates of gestational hypertension among pregnant women were 15.2%, chronic hypertension 7.9%, pre-eclampsia 36.4%, and eclampsia 3.0% [54]. In terms of fetal outcomes, hypertensive disorders of pregnancy (HDP) are linked to vascular manifestations, oxidative stress, and endothelial damage. This impacts how the placenta functions, as it results in inadequate nutrient supply and perfusion for the fetus. Consequently, this leads to negative perinatal outcomes [55]. Globally, hypertensive disorders during pregnancy are responsible for 15% of perinatal deaths [56]. Approximately 16% of the estimated 2.6 million stillbirths that happen annually occur in pregnancies impacted by HDP [57].

A study conducted in Sukkur, Pakistan, discovered that when assessing neonatal outcomes, there were most intrauterine deaths followed by stillbirths, and neonatal deaths. Out of these 95 remained alive of which the number of those in good health was 44. Of the 51 newborns with complications, 5 had respiratory distress syndrome (RDS), 10 were diagnosed with intrauterine growth restriction (IUGR), 10 experienced low birth weight (LBW), 12 were born preterm, 14 had meconium aspiration syndrome [58].

Thus, it is necessary to carry out additional prospective studies in the near future that consider various factors, including socio-economic characteristics and ecological factors, in Pakistan [59].

The condition is linked to elevated rates of morbidity and mortality for mothers and newborns. A close antenatal follow-up could prevent the condition's devastating effects. To guide health care providers, further prospective studies from various regions of the country are necessary to determine the frequency, clinical pattern, and impact of this disorder [60].

Chronic Respiratory Diseases (CRDs):

The occurrence and importance of respiratory disorders in pregnant women have risen significantly in recent years [61]. Various physiological changes occur in the respiratory system during pregnancy, such as increased oxygen consumption, an elevated positioning of the diaphragm due to the growing uterus, and an increased vulnerability to respiratory infections. The occurrence of respiratory illnesses in pregnant women can increase due to these changes and the modulation of the immune system that occurs during pregnancy. Common respiratory ailments can endanger both mother and the developing fetus [62].

Acute respiratory diseases like pneumonia or influenza can lead to considerable maternal and fetal deaths and worsen pre-existing chronic respiratory conditions. To prevent complications, careful management of chronic respiratory diseases like asthma and COPD during pregnancy is essential. RDS is among the most common causes of respiratory failure in infants and neonatal mortality. It arises fundamentally from underdeveloped lungs, which leads to inadequate production of lung surfactant [63].

A study conducted in Abbottabad found that women with asthma experienced pregnancy complications like hypertension (17.7%), GDM (12.3%), and Anemia (8.8%), along with a higher rate of caesarean sections (19.1%). Due to their low APGAR scores at delivery, 46.3% of the babies born to these mothers were admitted to the NICU with 6.1% receiving treatment for respiratory distress syndrome [64].

Moreover, membrane rupture is an important complication marked by the breaking of the fetal membranes prior to labor beginning. Preterm membrane rupture occurs in three percent of deliveries [65].

As a result, healthcare providers should take respiratory health into account during prenatal care and increase monitoring of pregnant patients with these chronic respiratory conditions in order to manage and possibly lessen the risk of PROM [66].

Conclusion:

This study presents an overview of the non-communicable diseases commonly associated with birth defects. It has been demonstrated on various occasions that NCDs adversely affect pregnancy and birth outcomes.

To develop cost-effective interventions, it is crucial to identify gaps and weaknesses in the medical sector. The major health system problems in Pakistan include inadequate resources, lack of risk factor surveillance, fragmented health services delivery mechanisms, low prioritization of NCDs in information systems, and high out-of-pocket spending.

Our environment requires the establishment of prenatal congenital heart disease (CHD) screening programs for newborns of mothers with diabetes. Additionally, to thoroughly understand the full effects of maternal obesity for both pregnancy and the offspring, further investigation is needed. Furthermore, as preexisting heart disease has major function among the outcomes in mothers and newborns, it is necessary for future mothers to receive proper counseling regarding the impact of the disease on pregnancy.

Moreover, it is essential to carry out regular antenatal screening and to adopt personalized care strategies aimed at reducing the maternal and fetal risks related to pregnancy-induced hypertension. To reduce the frequency of birth defects, it is crucial to regard respiratory disorders with the same seriousness as other conditions. Effective interventions can help to reduce the disease burden due to NCDs.

References

Global status report on noncommunicable diseases 2014 [Internet]. 2014 [cited 2015]. Available from: http://www. who.int/ nmh/publications/ncd-status-report-2014/en/.

Salam, R. (2016). Expanding the definition of noncommunicable disease. Journal of social health and diabetes, 4(02), 067-070.

WHO Fact Sheet; Non Communicable Diseases [Internet]. World Health Organization. 2015 [cited 2016]. Available from: http://www.who.int/mediacentre/factsheets/fs355/en/.

Habib, S. H., & Saha, S. (2010). Burden of non-communicable disease: global overview. Diabetes & Metabolic Syndrome: Clinical Research & Reviews, 4(1), 41- 47.

Facing the noncommunicable disease (NCD)global epidemic the battle of prevention starts in utero-the FIGO challenge. Roura LC, Arulkumaran SS. ClinObstetGynaecol. 2015 ;29(1):32-42.

Shannon LM, David EB, Eli YA. Noncommunicable Diseases, A Global Health Crisis in a New World Order. JAMA. 2012;307(19):2037-2038

Report on the status of major health risk factors for noncommunicable diseases: WHO African Region, 2015. http://www.afro.who.int/en/noncommunicable-diseases/npc-publications/2540-publications-non-communicable-disease prevention-a-control.html.

World Health Organization - Noncommunicable Diseases (NCD) Country Profiles [Internet]. 2014 [cited 2014]. Available from: http://www.who.int/nmh/publications/ncd-profiles 2014/en/.

Khan FS, Lotia-Farrukh I, Khan AJ, Siddiqui ST, Sajun SZ, Malik AA, et al. The Burden of Non-Communicable Disease in Transition Communities in an Asian Megacity: Baseline Findings from a Cohort Study in Karachi, Pakistan. PLoS One. 2013 Feb 13;8(2)

Naseem S, Khattak UK, Ghazanfar H, Irfan A. Prevalence of non-communicable diseases and their risk factors at a semi-urban community, Pakistan. Pan African Medical Journal. 2016 Mar 31;23.

Jabeen N, Malik S. Prevalence of Congenital Anomalies and Non-Communicable Diseases in Women of Age 12–75 years in District Bhimber, Azad Jammu and Kashmir Pakistan. Iranian J Publ Health. 2014;43(1):42–9.

Trends in Maternal Mortality: 1990 to 2015: estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. 2015.

UNICEF. Every child alive: the urgent need to end newborn deaths. 2018.

Basu S, McKee M. Drivers of inequality in Millennium Development Goal progress: a statistical analysis. PLoS Med. 2010;7(3):e1000241. https://doi. org/10.1371/journal.pmed.1000241.

United Nations, Department of Economic and Social Affairs Population Division. World Population Prospects: The 2015 Revision. 2015.

United Nations Inter-agency Group for Child Mortality Estimation (UNICEF, WHO, United Nations Population Division and the World Bank).

Lawn JE, Blencowe H, Waiswa P, for The Lancet Ending Preventable Still births Series study group with The Lancet Stillbirth Epidemiology inves tigator group, et al. Stillbirths: rates, risk factors, and acceleration towards 2030. Lancet. 2016. https://doi.org/10.1016/S0140 -6736(15)00837 -5.

National Institute of Population Studies (NIPS) [Pakistan] and ICF. Pakistan Demographic and Health Survey 2017–18. Islamabad, Pakistan, and Rockville, Maryland, USA: NIPS and ICF; 2019.

Aberg A, Rydhstroem H, Frid A. Impaired glucose tol erance associated with adverse pregnancy outcome: a population-based study in southern Sweden. Am J Obstet Gynecol 2001;184:77-83.

Bernsten D. Epidemiology and genetic basis of congenital heart diseases. In: Behrman RE,

Kliegman RM, Jenson HB, editors. Nelson's textbook of pediatrics. 18thed. New Del hi: Saunders; 2008. p. 1878-81.

Pyeritz RE. Genetics and cardiovascular disease. In: Zipes DP, Libby P, Bonow RO, Braunwald E, editors. Braunwald's heart disease: textbook of cardiovascular medicine. 7th ed. Philadelphia: Elsevier Saunders; 2005. p. 1867-909.

Confidential Enquiry into Maternal and Child Health. Ma ternity service in 2002 for women with type 1 and type 2 diabetes. London: CEMACH; 2004. p.1-12.

Weingling AM. Offspring of diabetic pregnancy: short term outcomes. Semin Fetal Neonatal Med 2009;14:111 8.

Evers IM, de Valk HW, Visser GH. Risk of complications of pregnancy in women with type 1 diabetes: nationwide prospective study in the Netherlands BMJ 2004;328:915.

Hornberger LK. Maternal diabetes and the fetal heart. Heart 2006;92:1125-30.

Kumar SD, Dheen ST, Tay SSW. Maternal diabetes induces congenital heart defects in mice by altering the expres sion of genes involved in cardiovascular development. Cardiovasc Diabetol 2007;6:34.

Tang, L., Xu, S., Li, P., & Li, L. (2019). Predictors of insulin treatment during pregnancy and abnormal postpartum glucose metabolism in patients with gestational diabetes mellitus. Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy, 2655-2665.

ADA.Standardsofmedicalcareindiabetes-2015abridgedforprimarycarepro viders.ClinDiabetes.2015;33:97–111.http://dx.doi.org/10.2337/diaclin.33.2.97.

Girling, J., & Dornhorst, A. (2003). Pregnancy and diabetes mellitus. Textbook of diabetes, 2, 65-66.

Buchanan, T., Xiang, A. & Page, K. Gestational diabetes mellitus: risks and management during and after pregnancy. Nat Rev Endocrinol **8**, 639–649 (2012). https://doi.org/10.1038/nrendo.2012.96

Wren C, Birrell G, Hawthorne G. Cardiovascular malformations in infants of diabetic mothers. Heart. 2003; 89(10):1217–1220.

Narchi H, Kulaylat N. Heart disease in infants of diabetic mothers. Images Paediatr Cardiol. 2000; 2(2):17–23.

Iqbal, H., Rehman, S. U., Abdurrazaq, A. A. K., Ali, M., & Haq, F. U. (2023). Frequency of Congenital Cardiac Conditions in Children Born to Diabetic Moms. Pakistan Journal of Medical & Health Sciences, 17(06), 378-378.

Muhammad, A., Khan, M., Khan, I., & Anwar, T. (2014). Frequency of congenital heart diseases in infants of diabetic mothers referred to pediatrics department. Journal of Postgraduate Medical Institute, 28(1).

Aslam M, Baloch GR, Hussain W, Naheed A, Malik A. Clinical spectrum of infants of diabetic mothers in hospitalized deliveries at Lahore. Pak J Pathol 2001;12:5-8.

Ejaz, Z., Khan, A. A., Ullah, S. S., Hayat, M. A., Maqbool, M. A., & Baig, A. A. (2023). The effects of gestational diabetes on fetus: a surveillance
study. Cureus, 15(2).

Shamoon, M., Ahsan, M., Maqbool, T., Aslam, R., & Yaseen, A. (2020). Congenital heart defects in neonates born to diabetic mother (IDM): A single center
experience. The Professional Medical Journal, 27(05), 950-956.

D. Vitner, K. Harris, C. Maxwell, and D. Farine, "Obesity in pregnancy: a comparison of four national guidelines," .Journal of Maternal-Fetal & Neonatal Medicine, vol. 32, no. 15, pp. 2580–2590, 2018.

C. Chen, X. Xu, and Y. Yan, "Estimated global overweight and obesity burden in pregnant women based on panel data model," PLoS One, vol. 13, no. 8, Article ID e0202183, 2018. P. M. Catalano and K. Shankar, "Obesity and pregnancy:

mechanisms of short term and long term adverse consequences for mother and child," BMJ, vol. 1, 2017.

Asad, U., Khan, S., Zulfiqar, S., Munawar, R., Akhtar, S., & Khalid, Z. (2022). Maternal and Fetal Outcomes in Obesity Complicated Pregnancies. Pakistan Journal of Medical & Health Sciences, 16(10), 518-518.

Li L-J, Huang L, Tobias DK, Zhang C. Gestational Diabetes Mellitus Among Asians – A Systematic Review From a Population Health Perspective. Front Endocrinol (Lausanne) [Internet]. 2022 Jun 16;13. Available from: https://www.frontiersin.org/articles/10.3389/fendo.2022.840331/full.

Corrales P, Vidal-Puig A, Medina-Gómez G. Obesity and Pregnancy, the Perfect Metabolic Storm. Eur J Clin Nutr. 2021;75(12):1723-34.

Short, V. L., Geller, S. E., Moore, J. L., McClure, E. M., Goudar, S. S., Dhaded, S. M., ... & Derman, R. J. (2018). The relationship between body mass index in pregnancy and adverse maternal, perinatal, and neonatal outcomes in rural India and Pakistan. American journal of perinatology, 35(09), 844-851.

Awan, S., Bibi, S., Makhdoom, A., Farooq, S., Sm, T., & Qazi, R. A. (2015). Adverse fetomaternal outcome among pregnant overweight women. Pakistan Journal of Medical Sciences, 31(2), 383.

Dobbenga-Rhodes YA, Preive AM. Assessment and evaluation of women with cardiac disease during pregnancy. J Perinat Neonatal Nurs 2006;20(4):295 302.

Wilkinson G. Saving mother's lives: reviewing maternal deaths to make motherhood safer 2006-2008. The eight report of the confidential enquiries into maternal deathinUnitedKingdom.BJOG2011;118:1-203.

Gelson E, Curry R, Gatzoulis MA, Swan L, Lupton M, Steer P, et al. Effect of maternal heart diseases on fetal growth.ObstetGynaecol2011;117(4):886-91.

DrenthenW,BoersmaE,BalciA, MoonsP,,MulderBJ, et al. Predictors of pregnancy complications in women with congenital heart disease. Eur Heart J 2010;31(17):2124-32.

Begum, Z., Ghani, A., Fawad, A., Mumtaz, H. N., Chohan, S. F., & Ghani, N. (2023). Maternal and Fetal Outcome in Cardiac Patients a Cross-Sectional Study at Tertiary Care Setting. Pakistan Journal of Medical & Health Sciences, 17(11), 148-148.

Liaqat, N., Khan, S. B., & Raheem, R. (2018). Maternofetal outcome in patients with cardiac diseases in a tertiary care hospital. Pakistan Heart Journal, 51(1).

Toloza FJK, Derakhshan A, Männistö T, Bliddal S, Popova PV, Carty DM, et al. Association between maternal thyroid function and risk of gestational hypertension and pre-eclampsia: a systematic review and individual-participant data meta-analysis. Lancet Diabetes Endocrinol. 2022;10(4):243-52.

Program, N. H. B. P. E. (2000). Report of the national high blood pressure education program working group on high blood pressure in pregnancy. American journal of obstetrics and gynecology, 183(1), s1-s22.

Vigil-De Gracia, P., Montufar-Rueda, C., & Ruiz, J. (2003). Expectant management of severe preeclampsia and preeclampsia superimposed on chronic hypertension

between 24 and 34 weeks' gestation. European Journal of Obstetrics & Gynecology and Reproductive Biology, 107(1), 24-27.

Yang Y, Le Ray I, Zhu J, Zhang J, Hua J, Reilly M. Preeclampsia Prevalence, Risk Factors, and Pregnancy Outcomes in Sweden and China. JAMA Netw Open. 2021;4(5):e218401.

Berhan, Y., & Berhan, A. (2014). Perinatal mortality trends in Ethiopia. Ethiopian journal of health sciences, 24, 29-40.

Lawn JE, Blencowe H, Waiswa P, et al.: Stillbirths: rates, risk factors, and acceleration towards 2030. Lancet. 2016, 387:587-603. 10.1016/S0140-

6736(15)00837-5
Vogel JP, Souza JP, Mori R, et al.: Maternal complications and perinatal mortality: findings of the World Health Organization Multicountry Survey on Maternal and Newborn Health. BJOG. 2014, 121 Suppl 1:76-88. 10.1111/1471-0528.12633
Nisa, S. U., Shaikh, A. A., Kumar, R., & Soomro, S. (2019). Maternal and fetal outcomes of pregnancy-related hypertensive disorders in a tertiary care hospital in Sukkur, Pakistan. Cureus, 11(8).
Basta, M., Hanif, K., Zafar, S., Khabazeh, A., Amin, F., Khan, S. S., ... & Khan II, S.
S. (2022). Impact of hypertensive disorders of pregnancy on stillbirth and other perinatal outcomes: a multi-center retrospective study. Cureus, 14(3).
Nisar, N., Memon, A., Sohoo, N. A., & Ahmed, M. (2010). Hypertensive disorders of pregnancy: frequency, maternal and fetal outcomes. Pak Armed Forces Med J, 60(1), 113-18.
Frye D, Clark SL, Piacenza D, Shay-Zapien G.Pulmonary complications in pregnancy. J Perinat Neonatal Nurs. 2011; 25(3):235–244.
Bibi, S., Irum, S., Safdar, H., Iqbal, A., Rehman, H. U., Istifa, L., ... & Hameed, Q. M. (2021). Acute and Chronic Respiratory Diseases in Pregnancy: Associations with Spontaneous Premature rupture of Membranes. Pakistan Journal of Chest
Medicine, 27(3), 165-169.
Jing L, Na Y, Ying L . High-risk factors of respiratory distress syndrome in term neonates: a retrospective case-control study. Balkan Med J. 2014;2014(1):64 8.
Bibi, A., Jadoon, S. M., Irshad, S., & Gul, M. (2021). Impact of Respiratory Diseases on Maternal and Perinatal Outcomes among Pregnant Women. Pakistan Journal of Chest Medicine, 27(3), 177-182.
Waters TP, Mercer B. Preterm PROM: prediction, prevention, principles. Clin Obstet Gynecol. 2011;54 (2):307-12.
Bibi, Sauda, Sadia Irum, Haseena Safdar, Atif Iqbal, Hamid Ur Rehman, Laraib Istifa, Shehzil Shahid, and Qazi Mohammad Hameed. "Acute and Chronic Respiratory Diseases in Pregnancy: Associations with Spontaneous Premature rupture of Membranes." Pakistan Journal of Chest Medicine 27, no. 3 (2021): 165-169.