

We are IntechOpen, the world's leading publisher of Open Access books Built by scientists, for scientists

6,900

Open access books available

186,000

International authors and editors

200M

Downloads

Our authors are among the

154

Countries delivered to

TOP 1%

most cited scientists

12.2%

Contributors from top 500 universities



WEB OF SCIENCE™

Selection of our books indexed in the Book Citation Index
in Web of Science™ Core Collection (BKCI)

Interested in publishing with us?
Contact book.department@intechopen.com

Numbers displayed above are based on latest data collected.
For more information visit www.intechopen.com



The Impact of Antenatal Care in Maternal and Perinatal Health

Teketel Ermias Geltore and Dereje Laloto Anore

Abstract

Every moment, somewhere in our planet especially in low income country, women of reproductive age group die from problems linked to gestations. The major reason for this enormous magnitude of complication is failure to use antenatal care services particularly in developing countries. The World Health Organization recommends a minimum of four ANC visits. However, global estimates indicate that only about half of all pregnant women receive this recommended amount of care. Antenatal care is one of the evidence-based interventions to decrease the probability of bad health outcomes for mothers and their newborns. Effectiveness of antenatal care, however, relies on the quality of care provided during each antenatal care visits. Antenatal care is an umbrella term used to describe the medical procedures and care that carried out starting from preconception. It is a care a woman receives throughout her pregnancy and is important in helping to ensure a healthy pregnancy state and safe childbirth. Therefore, antenatal care is to assure that every wanted pregnancy results in the delivery of a healthy baby without impairing the mother's health. The aim of this chapter is to examine the impact of antenatal care in decreasing maternal and newborn death from preconception through postnatal period.

Keywords: ANC Care, impact of ANC, preconception

1. Introduction

The World Health Organization launched a safe motherhood initiative in 1987, which aimed to reduce the number of complications and deaths related with pregnancy and childbirth [1]. In the provision of prenatal care, service care providers have often under emphasized women's health and health interventions aimed at improving reproductive care [2].

Healthy lifestyles during pregnancy are known to be associated with improved pregnancy outcomes for both mothers and offspring. As such, much attention has been placed on designing effective prenatal care guidance, and considerable research has been done to identify appropriate interventions to improve maternal and child health during the prenatal period [3, 4].

Among women who become pregnant, health risks experienced in the pre-conception period often continue during pregnancy, such as the use of alcohol, tobacco and other substances. Furthermore, the increasing prevalence of obesity and chronic conditions demand attention in the context of preconception care [5]. If these factors are not managed properly during this period, they may result in preterm delivery, low birth weight, stillbirth, birth defects, abortion and maternal complication [6–11].

Antenatal care is a comprehensive health supervision of a pregnant woman before delivery or it is planned examination, observation and guidance given to the pregnant women from preconception until postnatal period. The antenatal period presents an important chance for detecting threats to the mother and unborn baby's health, as well as for counseling on nutrition, danger signs, and family planning options after the birth [12, 13].

To reduce maternal and neonatal morbidity and mortality, the World Health Organization recommended that pregnant women should receive ANC services at least 4 times starting from the first trimester of pregnancy [14–16].

Good ANC for pregnant women has become a vital component in the safe motherhood program whose aim is to improve the outcome of pregnancy for mother and newborn [17, 18].

According to the WHO report, 60 million deliveries take place globally each year in which the woman is cared for her by relatives only, or by no one at all. Being a long distance from health services, multiple demands for women's time, low coverage and poor quality of ANC have been identified as key factors [19, 20].

In addition to the risk of dying during pregnancy and childbirth, many more women suffer from short and long-term maternal disabilities and illness. According to WHO for every maternal death, an estimated 30 to 50 women suffer pregnancy related health problems such as vesico vaginal fistulae, infertility, and depression that can be permanently debilitating [21].

ANC provides possibility to provide pregnant women with information, treat existing social and medical conditions, as well as screen for risk factors. However, it is not enough to receive ANC, because majority of the fatal complications occur during or shortly after delivery. Therefore, availability of skilled obstetric attendance during delivery is mandatory. However, use of these services in most developing countries is inhibited due to various cultural and demographic factors. As the result, disproportions between high income and low-income countries regarding use ANC, labor and delivery as well as postpartum services showed many difference. In developed countries about 97% of the pregnant women receive ANC and 99% use trained personnel during delivery, whereas in developing countries, only 65% and 53% of women use ANC and skilled obstetric care services, respectively [22, 23]. The aim of this chapter is to provide information on the importance of antenatal care in decreasing maternal and newborn death from preconception through postnatal period. This chapter identified the risk factors are associated with negative health outcomes for the woman, her fetus.

2. The benefits of ANC in decreasing maternal and neonatal death

According to the studies conducted in different countries, the finding revealed that provision of 0.4 mg of folic acid three months prior to pregnancy, during pregnancy, and six weeks postpartum has been associated with more than 80% reduction in different types of specific congenital anomalies [24–31]. On the other hand, the finding of different studies showed that preconception folic acid administration is associated with increased fetal growth, and decreased risks of low birth weight [32–34]. Moreover, other study result depicted that the consumption of folic acid prior to conception can decrease the risk of developing anemia [35].

The provision of ANC services brings with it a positive impact and it can be achieved through screening for pregnancy problems, assessing risk factors, treating problems that may arise during the antenatal period, providing information to the pregnant woman, preparing physically and psychologically for parturition and parenthood [36–38].

Moreover, it also focuses on educating the pregnant woman on a range of topics, including well-being, birth preparedness, complication readiness, and breastfeeding [39, 40]. ANC also provides effective interventions for preventing and treating certain conditions, such as anemia, hypertensive disorders of pregnancy, sexually transmitted diseases including HIV/AIDS external cephalic version to detect a breeched position [39, 41, 42]. The overall aim of ANC is to produce a healthy mother and baby at the end of pregnancy by allocating necessary budgetary resource [43–45]. The recommended time for patients to receive ANCIS; first visit better before or at 16 weeks, with the next visit at 24 and 28 weeks, third visit at 30–32 weeks and fourth visit better from 36 to 40 weeks. During these visits, the healthcare professional measures uterine height, checks fetal heartbeat, tests urine, and measures the mother's blood pressure [40].

ANC indirectly saves the lives of mothers and babies by promoting and establishing good health before childbirth and the early postnatal period — the periods of highest risk. ANC often presents the first contact opportunity for a woman to connect with health services, thus offering an entry point for integrated care, promoting healthy home practices, influencing care seeking behaviors, and linking women with pregnancy complications to a referral system. Women are more likely to give with a skilled attendant if they have had at least one ANC visit [46].

ANC offers pregnant women chance to access protective care. In developing countries where access to emergency obstetric services is limited, ANC presents a viable option for pregnant women to be screened for potential risks during pregnancy or delivery. It also provides an opportunity for treatment and health education including nutritional advice. On one hand practice of ANC, including the number of visits, to be associated with reduced risk of neonatal mortality, On the other hand, others study findings showed that found adverse or no relations between ANC utilization and birth outcomes and insufficient evidence that ANC interventions reduced neonatal or infant mortality in vulnerable populations [47–51].

ANC is very important in detection of high-risk pregnancies through the analysis of socioeconomic, medical and obstetrical factors. Beside to this, it is used as a platform for additional interventions that have been shown to positively influence the maternal and child health status, such as immunization, nutrition programs, breastfeeding and family planning and birth spacing counseling. Furthermore, ANC programs are used to provide care and information that is not directly related to pregnancy but can reduce the possible maternal risk factors, such as promoting healthy lifestyles, tackle malnutrition or inform about gender-based violence [52–70].

Some studies finding showed that ANC from a skilled provider was associated with decreased risk of neonatal mortality by the provision of the most effective ANC interventions included TT injection, and weight and blood pressure measurements [71].

TT vaccination that provide during ANC, protects the mother and the baby against tetanus, a deadly infection caused by *Clostridium tetani* bacteria, which enter the body through skin cuts and wounds such as those during delivery or cutting of the umbilical cord [72, 73].

In high-income settings, provision of ANC, skillful midwife-led has been associated with positive outcomes, including fewer preterm births, fewer fetal losses at any gestation, and high rates of positive experiences reported by women [74].

To improve maternal, newborn, and child health, the World Health Organization and other organizations, over the past years, have been encouraging for continuum of care. It can provide as a key package of programs for MNCH, and can show a corridor to help reduce maternal and neonatal deaths [75–78].

Effective and timely maternal health care before conception, as well as during pregnancy and childbirth, could save nearly 3 million newborns in high burden countries. Most neonatal deaths could be prevented by direct interventions. Evidence suggests that two thirds of neonatal deaths could be prevented if all pregnant mothers and newborns had access to cost-effective and direct interventions as well as receiving care from skilled health care providers during pregnancy and childbirth [79–88].

High quality ANC can also influence women's health seeking behavior towards choosing skilled care at birth and helping them prepare to be able to access it. A positive experience during both pregnancy and childbirth are vital to person-centered care and the right of every childbearing woman, as highlighted in recent World Health Organization recommendations [89–94].

3. Risk factors are associated with negative health outcomes for the woman, her fetus

A literature review reported usage of ginger during pregnancy is not a safe. Higher doses of ginger can cause thinning of blood, stomach discomfort and heartburn [95–99].

In developing countries, child marriage is widespread, with almost one-third of girls being married before age 18. A practice that is driven by poverty, social norms, and discrimination against girls, child marriage has emerged as an important social issue in recent years, due in part to increased concerns among reproductive health advocates about the harmful consequences for young women marrying too early. As a result: dropping out of school; health risks that result from early sexual activity and pregnancy, including sexually transmitted diseases and maternal mortality; being prevented from taking advantage of economic opportunities; and if they have children, child malnutrition and mortality. Moreover, at child marriage deprives girls of their basic human rights and puts them at risk for harmful practices including exploitation, intimate partner violence, and abuse [100–103].

A study conducted in Italy, and the result exposures of women to chemical agents, pesticides, physical agents, ergonomic factors and stress, it appears that at present the evidence is sufficient to warrant the maximum protection of pregnant women to several well-documented occupational risk factors. These include exposures to anaesthetic gases, antineoplastic drugs, heavy metals, solvents, heavy physical work and irregular work schedules. For other work risks, such as exposure to nonionizing radiation and psychosocial work stress, the evidence is often suggestive but not conclusive [104].

Substance use during pregnancy can be risky to the woman's health and that of her children in both the short and long term. Most drugs, including opioids and stimulants, could potentially harm an unborn baby. Use of some substances can increase the risk of miscarriage and can cause migraines, seizures, or high blood pressure in the mother, which may affect her fetus. In addition, the risk of stillbirth is 2 to 3 times greater in women who smoke tobacco or marijuana, take prescription pain relievers, or use illegal drugs during pregnancy [105]. Smoking tobacco during pregnancy is estimated to have caused 1,015 infant deaths per year from 2005 through 2009 [106].

Anemia during pregnancy is an important factor for negative health outcome for mother and her new born. The causes of anemia during pregnancy in developing countries are multifactorial; these include micronutrient deficiencies of iron, folate, and vitamins A and B12 and anemia due to parasitic infections such as malaria and hookworm or chronic infections like TB and HIV [107–111].

4. Conclusion

Antenatal care is an important determinant of high maternal mortality rate and one of the basic components of maternal care on which the life of mothers and babies depend. Thus, Antenatal care is a key strategy to improve maternal and infant health.

Early initiation of antenatal care facilitates the timely management and treatment of pregnancy complications to reduce maternal and newborns deaths.

Studies examining the effectiveness of antenatal care on maternal and newborn health outcomes have provided conflicting results.

Good ANC links the woman and her family with the formal health system, increases the chance of using a skilled attendant at birth and contributes to good health through the life cycle. Inadequate care during this time breaks a critical link in the continuum of care, and affects both women and babies.

Indirect causes of maternal morbidity and mortality, such as HIV and malaria infections, contribute to approximately 25% of maternal deaths and near misses, so that by utilization of appropriate ANC services STIs and other diseases can be prevented and managed concurrently through integrated service delivery.

Author details

Teketel Ermias Geltore^{1*} and Dereje Laloto Anore²

¹ Midwifery Department, School of Nursing and Midwifery, College of Health Sciences and Medicine, Wachemo University–Durame Campus, Durame, Ethiopia

² KembataTembaro Zone Health Department, Durame, Ethiopia

*Address all correspondence to: teketelermias@gmail.com

IntechOpen

© 2021 The Author(s). Licensee IntechOpen. This chapter is distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/3.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. 

References

- [1] Patel BB, Gurmeet P, Sinalkar DR, Pandya KH, Mahen A, Singh N. A study on knowledge and practices of antenatal care among pregnant women attending antenatal clinic at a Tertiary Care Hospital of Pune, Maharashtra. *Med J DY Patil Univ* 2016; 9:354-362.
- [2] Atrash H, Jack BW, Johnson K, Coonrod DV, Moos M-K, Stubblefield PG, et al. Where is the “W”oman in MCH? *Am J Obstet Gynecol* 2008; 199(6, Suppl. B): S259-65.
- [3] Chapin RE, Robbins WA, Schieve LA, Sweeney AM, Tabacova SA, Tomashek KM: Off to a good start: the influence of pre- and periconceptional exposures, parental fertility, and nutrition on child’s health. *Environ Health Perspect* 2004, 112:69-78.
- [4] Association of state public health nutritionists; Preconception health: The role of nutrition. 2015
- [5] Begum KS, Sachchithanantham K, De Somsbuhra S. Maternal obesity and pregnancy outcome. *Clin Exp Obstet Gynecol* 2010; 38(1):14-20.
- [6] World Health Organization. Preconception health Regional expert group consultation on preconception care, in New Delhi, India. 2013
- [7] Curtis M, Abelman S, Schulkin J, Williams JL, Fassett EM (2006) The History of preconception care: Evolving guidelines and standards. *Maternal Child Health* 10: 43-52.
- [8] Hanson MA, Bardsley A, De-Regil LM, Moore SE, Oken E, et al. The International Federation of Gynecology and Obstetrics (FIGO) recommendations on adolescent, preconception, and maternal nutrition. *Int J Gynecol Obstet*. 2015 131: S213-S253.
- [9] Centre for disease control. Control and prevention of rubella: evaluation and management of suspected outbreaks, rubella in pregnant women, and surveillance for congenital rubella syndrome. *MMWR* 50: 23.
- [10] Hoyt MJ, Storm DS, Aaron E, Anderson J Preconception and contraceptive care for women living with HIV. *Infectious Diseases in Obstetrics and Gynecology*. 2012 P: 604183.
- [11] Cruz J, Márquez A, Lang J, Valdés L Care to pregnancy diabetic achievement and challenge in Cuba. *Sci FLO public health*. 2013 15: 3.
- [12] World Health Organization (WHO). What is the effectiveness of antenatal care? Copenhagen, WHO Regional Office for Europe, Health Evidence Network report; accessed. March 23, 2009. Website available at <http://www.euro.who.int/Document/E87997.pdf>,
- [13] Carroli G, Rooney C, Villar J. How effective is antenatal care in preventing maternal mortality and serious morbidity? An overview of the evidence. *Paediatr Perinat Epidemiol*. 2001; 15(Supply 1):1-42.
- [14] J. Villar and B. Bergsjö, UNDP/UNFPA/WHO/World Bank Special Program of Research, Development and Research Training in Human Reproduction. WHO Antenatal Care Randomized Trial: Manual for the Implementation of the New Model, World Health Organization-Department of Reproductive Health and Research, Geneva, Switzerland, 2002.
- [15] World health organization Preconception care: Maximizing the gains for maternal and child health. Global consensus meeting. 2012
- [16] World health organization Reduction of maternal and child

mortality and morbidity. What's the role of Preconception care in the life course approach. Third congress on preconception health and care, Uppsala, Sweden. 2016

[17] Omigbodun AO. Preconception and antenatal care. In: Comprehensive Obstetrics in the Tropics. Ch 2. Kwawukume EY, Emuveyan EE, eds. Accra: Asante and Hittscher, 2002:7-14

[18] Yakoob MY, Menezes EV, Soomro T, Haws RA, Darmstadt GL, Bhutta ZA. Reducing stillbirths: behavioural and nutritional interventions before and during pregnancy. *BMC Pregnancy Childbirth* 2009;9:10

[19] Darmstadt GL, Lee AC, Cousens S, Sibley L, Bhutta ZA, Donnay F, Osrin D, Bang A, Kumar V, Wall SN, Baqui A, Lawn JE: 60 million non-facility births: who can deliver in community settings to reduce intra-partum related deaths? *Int J Gynaecol Obstet* 2009, 107: S89–S112.

[20] Mrisho M, Schellenberg JA, Mushi AK, Obrist B, Mshinda H, Tanner M, Schellenberg D: Factors affecting home delivery in rural Tanzania. *Trop Med Int Health* 2007, 12:862-872.

[21] WHO, Maternal Mortality in 1995: Estimates Developed by WHO, UNICEF, UNFPA and the World Bank, WHO, Geneva, Switzerland, 2001.

[22] I. Addai, "Determinants of use of maternal-child health services in rural Ghana," *Journal of Biosocial Science*, vol. 32, no. 1, pp. 1– 15, 2000.

[23] Family Care International and the Safe Motherhood Inter Agency Group, 2002, <http://www.safemotherhood.org/>.

[24] T. Marchant, J.A. Schellenberg, R. Nathan et al. "Anemia in pregnancy and infant mortality in Tanzania," *Tropical*

Medicine and International Health, vol. 9, no. 2, pp.262-266, 2004.

[25] F. Habib, E. H. Alabdin, M. Alenazy, and R. Nooh, "Compliance to iron supplementation during pregnancy," *Journal of Obstetrics and Gynecology*, vol. 29, no. 6, pp. 487-492, 2009.

[26] E. Ekweagwu, A. E. Agwu, and E. Madukwe, "The role of micronutrients in child health: are views of literature," *African Journal of Biotechnology*, vol. 7, no. 11, pp.1604-1611, 2008.

[27] D. K. Tobias, C. Z. hang, J. Chavarro et al., "Pre pregnancy adherence to dietary patterns and lower risk of gestational diabetes mellitus," *American Journal of Clinical Nutrition*, vol. 96, no. 2, pp. 289-295, 2012.

[28] A. Czeizel, M. Dob' o, and P. Vargha, "Hungarian cohort controlled trial of pre conception multivitamin supplementation shows a reduction in certain congenital abnormalities," *Birth Defects Research Part A: Clinical and Molecular Teratology*, vol. 70, no. 11, pp. 853-861, 2004

[29] M. K. Moos, "Pre conception health promotion: progress in changing a prevention paradigm," *Journal of Perinatal & Neonatal Nursing*, vol. 12, no. 78, pp. 2-13, 2004.

[30] G. Teckie, A. Kromberg, and J. G. R Kromberg, "Neural tube defects in Gauteng, South Africa: recurrence risks and associated factors," *South African Medical Journal*, vol. 103, no. 12, pp. 973-977, 2013.

[31] M. Viswanathan, K. A. Treiman, J. Doto, J. C. Middleton, E. J. L. Coker-Schwimmer, and W. K. Nicholson, "Folic acid supplementation for the prevention of neural tube defects," *JAMA*, vol. 2017, no. 317, p. 2, 2015.

[32] V. A. Hodgetts, R. K. Morris, A. Francis, J. Gardosi, and K. M. Ismail,

“Effectiveness of folic acid supplementation in pregnancy on reducing the risk of small-for-gestational age neonates: a population study, systematic review and met analysis,” *BJOG: An International Journal of Obstetrics & Gynecology*, vol. 122, no. 4, pp. 478-490, 2014.

[33] S. Timmermans, V. Jaddoe, A. Hofmannsthal., “Preconception folic acid supplementation, fetal growth and the risks of low birth weight and preterm birth: the Generation R Study,” *British Journal of Nutrition*, vol. 102, no. 5, pp. 777-785, 200

[34] B.O. Verburg, E.A. Steegers, M. De Ridder et al. “New charts for ultrasound dating of pregnancy and assessment of fetal growth: longitudinal data from a population-based cohort study,” *Ultrasound in Obstetrics and Gynecology*, vol. 31, no. 4, pp. 388-396, 2008.

[35] J. A. Greenberg, S. J. Bell, Y. Guan, and Y. H. Yu, “Folic acid supplementation and pregnancy: more than just neural tube defect prevention,” *Reviews in Obstetrics & Gynecology*, vol. 4, no. 5, pp. 2-9, 2011.

[36] Kisuule I, Kaye DK, Najjuka F, et al. Timing and reasons for coming late for the first antenatal care visit by pregnant women at Mulago hospital, Kampala Uganda. *BMC Preg Childbirth*. 2013; 13:1.

[37] Perumal N, Cole DC, Ouédraogo HZ, et al. Health and nutrition knowledge, attitudes and practices of pregnant women attending and not-attending ANC clinics in Western Kenya: a cross-sectional analysis. *BMC Preg Childbirth*. 2013; 13:1.

[38] WHO Global Health Observatory (GHO): Antenatal care situations and trends. 2011.

[39] Das AC. A comprehensive study on the effectiveness of voucher scheme on antenatal, delivery and postnatal care among poor women in Bhola District, Bangladesh. *Int J Higher Edu Res* 2015; 5(2):1-11.

[40] Ministry of Health Report. Memorandum on antenatal clinics: their conduct and scope. Ministry of Health, London, 1929.

[41] Maine D. Safe motherhood programs: options and issues. Prevention of maternal mortality. Center for Population and Family Health. United States of America, 1991.

[42] Das AC. exploring the constraints regarding maternal health in reproductive age among the rural women in Bangladesh. *Mediscope* 2016; 3(2):1-10.

[43] Lucas AO, Stoll BJ, Bale JR. Improving birth outcomes: meeting the challenge in the developing world. National Academies Press; 2003.

[44] Lindmark G, Cnattingius S. The scientific basis of antenatal care: report from a state-of-the-art conference. *Acta Obstet Gynecol Scand* 1991; 70(2):105-109.

[45] Gay J, Hardee K, Judice N, et al. What works: a policy and program guide to the evidence on family planning, safe motherhood and STI/HIV/AIDS Interventions: Module 1: Safe Motherhood. POLICY Project, 2003

[46] Ornella Lincetto, Seipati Mothebesoane-Anoh, Patricia Gomez, Stephen Munjanja. Opportunities for Africa's Newborns

[47] Ibrahim J, Yorifuji T, Tsuda T, Kashima S, Doi H. Frequency of antenatal care visits and neonatal mortality in Indonesia. *J Trop Pediatr* 2012; 58:184-188.

- [48] Raatikainen K, Heiskanen N, Heinonen S. Under-attending free antenatal care is associated with adverse pregnancy outcomes. *BMC Public Health* 2007;7:1.
- [49] . Hollowell J, Oakley L, Kurinczuk JJ, Brocklehurst P, Gray R. The effectiveness of antenatal care programs to reduce infant mortality and preterm birth in socially disadvantaged and vulnerable women in high-income countries: a systematic review. *BMC Pregnancy Childbirth* 2011; 11:13.
- [50] Singh A, Pallikadavath S, Ram F, Alagarajan M. Do antenatal care interventions improve neonatal survival in India? *Health Policy Plan* 2014; 29:842-848.
- [51] Dowswell T, Carroli G, Duley L et al. Alternative versus standard packages of antenatal care for low-risk pregnancy. *Cochrane Database Syst Rev.* 2010; 10:CD000934.
- [52] Imdad A, Bhutta ZA. Effects of calcium supplementation during pregnancy on maternal, fetal and birth outcomes. *Paediatr Perinat Epidemiol* 2012; 26Suppl 1:138-52.
- [53] Oddy WH, Kendall GE, Li J, et al. The long-term effects of breastfeeding on child and adolescent mental health: a pregnancy cohort study followed for 14 years. *J Pediatr* 2010; 156:568-574.
- [54] Black RE, Victora CG, Walker SP, et al. Maternal and child under nutrition and overweight in low-income and middle-income countries. *Lancet* 2013; 382:427-451.
- [55] Gupta A. Breastfeeding and child health. *Economic and Political Weekly* 2006.
- [56] Ota E, Hori H, Mori R, et al. Antenatal dietary education and supplementation to increase energy and protein intake. *Cochrane Database Systematic Review.* 2015.
- [57] . Pena-Rosas JP, De-Regil LM, Garcia-Casal MN, et al. Daily oral iron supplementation during pregnancy. *Cochrane Database Systematic Review.* 2015.
- [58] Haider BA, Bhutta ZA. Multiple-micronutrient supplementation for women during pregnancy. *Cochrane Database Systematic Review* 2015.
- [59] . World Health Organization. WHO statement on antenatal care. Geneva, Switzerland: World Health Organization, 2011
- [60] McNellan CR, Dansereau E, Colombara D, et al. Uptake of antenatal care, and its relationship with participation in health services and behaviors: an analysis of the poorest regions of four Mesoamerican countries. *Ann Glob Health* 2017; 83:193-194.
- [61] Chen XK, Wen SW, Yang Q, et al. Adequacy of prenatal care and neonatal mortality in infants born to mothers with and without antenatal high-risk conditions. *Aust N Z J Obstet Gynaecol* 2007; 47:122-7.
- [62] Zanconato G, Msolomba R, Guarenti L, et al. Antenatal care in developing countries: the need for a tailored model. *Semin Fetal Neonatal Med* 2006; 11:15-20.
- [63] PMNCH. The PMNCH Report 2012. Analysing Progress on Commitments to the Global Strategy for Women's and Children's Health. Geneva, Switzerland: World Health Organization, 2012.
- [64] Titaley CR, Dibley MJ. Antenatal iron/folic acid supplements, but not postnatal care, prevents neonatal deaths in Indonesia: analysis of Indonesia demographic and health surveys 2002/2003-2007 (a retrospective cohort study). *BMJ Open* 2012;2:e001399

- [65] deJongh TE, Gurol-Urganci I, Allen E, et al. Integration of antenatal care services with health programmes in low- and middle-income countries: systematic review. *J Glob Health* 2016; 6:010403.
- [66] Abou-Zahr C, Wardlaw T. Antenatal care in developing countries: promises, achievements and missed opportunities. Geneva: World Health Organization, 2003.
- [67] Khan KS, Wojdyla D, Say L, et al. WHO analysis of causes of maternal death: a systematic review. *Lancet* 2006; 367:1066-1074.
- [68] Lincetto O, Mothebesoane-Anoh S, Gomez P, et al. In opportunities for Africa's newborns. PMNCH 2006.
- [69] Carroli G, Rooney C, Villar J. How effective is antenatal care in preventing maternal mortality and serious morbidity? An overview of the evidence. *Paediatr Perinat Epidemiol* 2001;15Suppl 1:1-42.
- [70] Moss W, Darmstadt GL, Marsh DR, et al. Research priorities for the reduction of perinatal and neonatal morbidity and mortality in
- [71] McCurdy RJ, Kjerulff KH, Zhu J. Prenatal care associated with reduction of neonatal mortality in Sub-Saharan Africa: evidence from Demographic and Health Surveys. *Acta ObstetGynecol Scand*. 2011; 90:779-790.
- [72] World Health Organization. Maternal immunization against tetanus: integrated management of pregnancy and childbirth. Geneva: World Health Organization; 2006.
- [73] Demicheli V, Barale A, Rivetti A. Vaccines for women for preventing neonatal tetanus. *Cochrane Database Syst Rev*. 2015; 7:Cd002959.
- [74] Sandall J, Soltani H, Gates S, Shennan A, Devane D. Midwifery-led continuity models versus other models of care for childbearing women. *Cochrane Database Syst Rev* 2016;4: CD004667.
- [75] Tinker A, ten Hoope-Bender P, Azfar S, Bustreo F, Bell R. A continuum of care to save newborn lives. *The Lancet*. 2005; 365: 822-825.
- [76] Kerber KJ, de Graft-Johnson JE, Bhutta ZA, Okong P, Starrs A, Lawn JE. Continuum of care for maternal, newborn, and child health: from slogan to service delivery. *The Lancet*. 2007; 370: 1358-1369.
- [77] Martines J, Paul VK, Bhutta ZA, Koblinsky M, Soucat A, Walker N, et al. Neonatal survival: a call for action. *Lancet*. 2005; 365: 1189-1197.doi: 10.1016/S0140-6736(05)71882-1 PMID: 15794974
- [78] UNICEF, UNICEF. Committing to Child Survival Progress Report 2012: a Promise Renewed. [Internet]. New York: United Nations Children's Fund, The (UNICEF); 2012. Available: http://www.unicef.org/publications/files/APR_Progress_Report_2012_11Sept2012.pdf
- [79] Black RE, Cousens S, Johnson HL, Lawn JE, Rudan I, Bassani DG, et al. Global, regional, and national causes of child mortality in 2008: a systematic analysis. *Lancet*. 2010; 375(9730):1969-87. [https://doi.org/10.1016/S0140-6736\(10\)60549-1](https://doi.org/10.1016/S0140-6736(10)60549-1) PMID: 20466419
- [80] Liu L, Johnson HL, Cousens S, Perin J, Scott S, Lawn JE, et al. Global, regional, and national causes of child mortality: an updated systematic analysis for 2010 with time trends since 2000. *Lancet*. 2012; 379 (9832):2151-61. [https://doi.org/10.1016/S0140-6736\(12\)60560-1](https://doi.org/10.1016/S0140-6736(12)60560-1) PMID: 22579125
- [81] Lawn J, Kerber K. Opportunities for Africa's newborns: practical data policy and programmatic support for newborn care in Africa. 2006.

- [82] Darmstadt GL, Walker N, Lawn JE, Bhutta ZA, Haws RA, Cousens S. Saving newborn lives in Asia and Africa: cost and impact of phased scale-up of interventions within the continuum of care. *Health policy and planning*. 2008; 23(2):101-17. <https://doi.org/10.1093/heapol/czn001> PMID: 18267961
- [83] Unicef. Committing to child survival: a promise renewed. Progress report 2015. New York: UNICEF. 2015.
- [84] Bhutta ZA, Das JK, Bahl R, Lawn JE, Salam RA, Paul VK, et al. Can available interventions end preventable deaths in mothers, newborn babies, and stillbirths, and at what cost? *The Lancet*. 2014; 384 (9940):347-370.
- [85] UNICEF. Levels & trends in child mortality. Estimates developed by the UN inter-agency group for child mortality estimation. New York: UNICEF. 2017.
- [86] WHO. Every Newborn: An action plan to end preventable deaths. 2014.
- [87] UN DoEaSA, Population Division, Population Division. World population prospects: The 2015 Revision, Key Findings and Advance Tables. Working Paper No. ESA/P/WP. 241; 2015
- [88] Raven JH, Tolhurst RJ, Tang S, Van Den Broek N. What is quality in maternal and neonatal health care? *Midwifery*. 2012; 28(5):e676–e83. <https://doi.org/10.1016/j.midw.2011.09.003> PMID: 22018395
- [89] WHO | WHO statement on antenatal care. WHO. http://www.who.int/maternal_child_adolescent/documents/rhr_11_12/en/. Accessed 9 Sep 2013.
- [90] Chukwuma A, Wosu AC, Mbachu C, Weze K. Quality of antenatal care predicts retention in skilled birth attendance: a multilevel analysis of 28 African countries. *BMC Pregnancy Childbirth*. 2017;17:152.
- [91] Adjiwanou V, LeGrand T. Does antenatal care matter in the use of skilled birth attendance in rural Africa: a multi-country analysis? *SocSci Med*. 2013; 86:26-34.
- [92] Afulani PA, Moyer C. Explaining disparities in use of skilled birth attendants in developing countries: a conceptual framework. *PLoS One*. 2016; 11:0154110.
- [93] World Health Organisation. WHO recommendations on antenatal care for a positive pregnancy experience. 2016. http://www.who.int/reproductivehealth/publications/maternal_perinatal_health/anc-positivepregnancy-experience/en/. Accessed 18 Sep 2018.
- [94] World Health Organization. WHO recommendations: intrapartum care for a positive childbirth experience. WHO. 2018. <http://www.who.int/reproductivehealth/publications/intrapartum-care-guidelines/en/>. Accessed 28 Feb 2018.
- [95] Tunçalp Ö, Were W, MacLennan C, Oladapo O, Gülmezoglu A, Bahl R, et al. Quality of care for pregnant women and newborns—the WHO vision. *BJOG Int J Obstet Gynaecol*. 2015; 122:1045-1049.
- [96] Loke Y, editor. *Pregnancy and Breastfeeding Medicines Guide*. 1st ed. Melbourne: The Royal Women's Hospital, Pharmacy Department; 2010
- [97] Braun L, Cohen M. *Herbs and Natural Supplements*. Third ed. Churchill Livingstone, Australia: Elsevier; 2010
- [98] Australian Pharmaceutical Formulary and Handbook. 22nd ed. Canberra: Pharmaceutical Society of Australia; 2012

- [99] Wilkinson JM. What do we know about herbal morning sickness treatments? A literature survey. *Midwifery*. 2000; 16:224-228
- [100] UNICEF. State of the World's Children 2013: Children with Disabilities. New York: United Nations Children's Fund; 2013.
- [101] Mensch BS, Singh S, Casterline JB. Trends in the timing of first marriage among men and women in the developing world. In: Lloyd CB, Behrman JR, Stromquist NP, Cohen B, editors. *The changing transitions to adulthood in developing countries: Selected studies*. Washington, D.C.: The National Academies Press; 2006. p. 118-71.
- [102] . Klugman J, Hanmer L, Twigg S, Hasan T, McCleary-Sills J, Santamaria J. *Voice and Agency: Empowering Woman and Girls for Shared Prosperity*. Washington DC: The World Bank Group; 2014.
- [103] Jain S, Kurz K. *New insights on preventing child marriage: A global analysis of factors and programs*. New Delhi: International Center for Research on Women; 2007.
- [104] Irene Figa`-Talamanca, Occupational risk factors and reproductive health of women *Occupational Medicine* 2006;56:521-531 doi:10.1093/occmed/kql114
- [105] Tobacco, drug use in pregnancy can double risk of stillbirth. Eunice Kennedy Shriver National Institute of Child Health and Human Development. <https://www.nichd.nih.gov/news/releases/Pages/121113-stillbirth-drug-use.aspx>. Published December 11, 2013. Accessed January 31, 2018.
- [106] National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health. *The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General*. Atlanta (GA): Centers for Disease Control and Prevention (US); 2014. <http://www.ncbi.nlm.nih.gov/books/NBK179276/>.
- [107] S. E. Msuya, T. H. Hussein, J. Uriyo, N. E. Sam, and B. Stray-Pedersen, "Anaemia among pregnant women in northern Tanzania: prevalence, risk factors and effect on perinatal outcomes," *Tanzania Journal of Health Research*, vol. 13, no. 1, pp. 33-39, 2011.
- [108] E. M. McClure, S. R. Meshnick, P. Mungai et al., "The association of parasitic infections in pregnancy and maternal and fetal anemia: a cohort study in coastal Kenya," *PLOS Neglected Tropical Diseases*, vol. 8, no. 2, Article ID e2724, 2014.
- [109] O. T. Okube, W. Mirie, E. Odhiambo, W. Sabina, and M. Habtu, "Prevalence and Factors Associated with Anaemia among Pregnant Women Attending Antenatal Clinic in the Second and Third Trimesters at Pumwani Maternity Hospital, Kenya," *Open Journal of Obstetrics and Gynecology*, vol. 06, no. 01, pp. 16-27, 2016.
- [110] S. Brooker, P. J. Hotez, and D. A. P. Bundy, "Hookworm-related anaemia among pregnant women: a systematic review," *PLOS Neglected Tropical Diseases*, vol. 2, no. 9, article e291, 2008.
- [111] S. Ononge, O. Campbell, and F. Mirembe, "Haemoglobin status and predictors of anaemia among pregnant women in Mpigi, Uganda," *BMC Research Notes*, vol. 7, no. 1, article no. 712, 2014.