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Alarming Frequency and after Effects of Maternal Anemia in Pakistan

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Abstract

Anemia is caused due to usually iron based nutritional deficiency in blood. Its severity varies from mild to fatal. Recent reported data of Pakistan indicates that anemia cannot be ignored as it may affect fetus or maternal health or may cause death of any of them. The frequent symptoms are poor fetal growth, gastrointestinal bleeding, spontaneous abortion, low infant weight, less placental size and fetal or sometimes maternal death. Moreover, current data highlights that maternal anemia is common among females of province Sindh up to alarming level than in other provinces of Pakistan. As its diagnosis is usually delayed. People ignore the symptoms and still there is lack of awareness among masses. It should be controlled by government and concerned authorities by spreading general public awareness related to preventive measures, handling and cure of maternal anemia and to ensure the lives and health of both mother and developing fetus.

Keywords: Anemia; fetus; maternal anemia; public awareness; Pakistan; nutritional deficiency; fetal growth.

1. Introduction

Anemia is most noticeable nutritional deficiency based hematological disorder among the pregnant women. WHO declared that the deficiency of some vital nutrients (folic acid, vitamin A, vitamin B12, vitamin C, iron, amino acid and proteins) lessen the content of hemoglobin in blood causes anemia.

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This anemic state becomes a case of more consideration during pregnancy (maternal anemia). Because it not only affects the health of mother but also of fetus even in case of mild anemic state [1, 2]. Moreover, it is important to mention here, during normal pregnancy cases, dilution of hemoglobin concentration takes place due to increased blood circulation [3]. The dilution of blood begins by the end of first trimester and lasts up to third trimester [4]. So, this normal physiological change in maternal blood during gestation period should not be misinterpreted as anemia. As normal hemoglobin (Hb) level is 12g/dl so a pregnant woman is said to be anemic, when Hb concentration is about 10-11g/dl. It is considered as mild anemic condition. The Hb concentration in moderate and severe anemia have been reported up to 7-9.9g/dl and less than 7 respectively [5, 6, 7]. Whereas a rare and fatal type of anemia has also been reported, aplastic anemia which is basically a bone marrow hypercellularity disorder [8, 9, 10]. Not only in Pakistan but round the globe, maternal anemia is the most common ailment among the pregnant women and about 56 million pregnant women of the world are affected by anemia [6]. As an outcome, neonatal anemia is also frequently reported, and its significant ratios are: 14% in developed countries whereas up to 51% in developing countries. In addition to this, 20% maternal death in developing countries occur due to anemia [2, 4]. Moreover, the prevalence rate of maternal anemia has been reported from different regions of the world. It is about 13.4% in Thailand, 51% in Indonesia, 58% in Sri Lanka, 63% in Nepal, 74% in Bangladesh and highest rate of maternal anemia is suspected to be in India which is 87% [11]. There are diverse factors which are responsible for maternal anemia but the mostly anemia is reported due to iron deficiency which ranges between 75%-80% [12]. The complications frequently caused by anemia during gestation period (Figure 1) are inhibited fetal growth, gastrointestinal bleeding, spontaneous abortion, low infant weight, less placental size and fetal death [13]. Annually, 115,000 maternal death and 591,000 prenatal deaths are reported due to maternal anemia. It is usually considered as simple disorder and mostly remain unnoticed, but it is not as simple as it seems. So, in order to reduce the risk of maternal anemia and to decline the increasing rate of maternal morbidity, the awareness about supplementary solutions and nutritional alternatives for improved Hb level should be provided to the women [14].

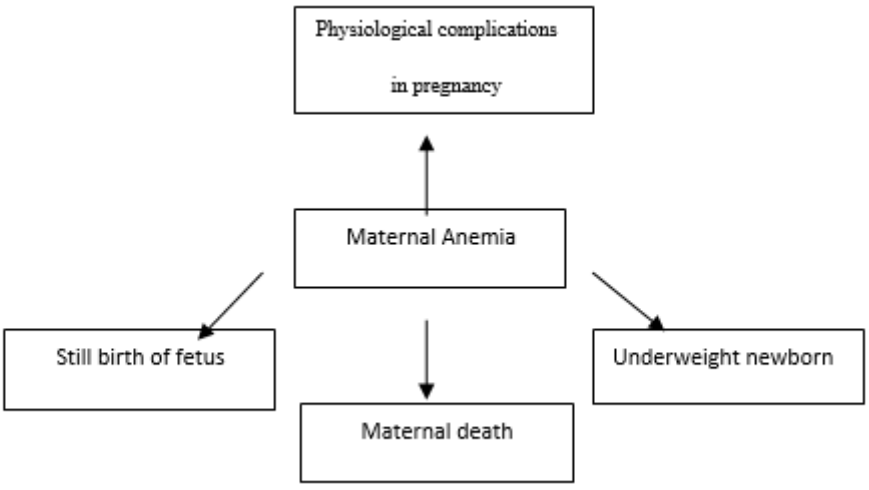

Figure 1: Possible aftereffects of Maternal Anemia

2. Causes & symptoms of maternal anemia

The poor maternal health due to malnutrition, infection and other physiological disturbances during pregnancy, along with increased need of nutrients for fetal growth make the pregnant women more vulnerable to anemia [15].Women with poor diet are 13 times more vulnerable to anemia than those with proper nourishment [16]. Reported data indicates that out of 1.62 billion anemic people, 56 million are pregnant women [6]. Women who are not receiving prenatal iron and folate supplements mostly suffer by anemia. Although, hemolytic and aplastic anemia are also dangerous but maternal and fetal health is most severely affected by iron deficiency anemia such as sickle cell disease and thalassemia and sometimes due to gestion stage too [17, 18]. Socioeconomic, geographic and demographic factors having adverse influence on maternal health and result in anemia. As a smaller number of individuals are with 5 or 6 gr/dl Hb level so anemic cases are rare in developed countries. Anemia is common in under-developed and developing countries due to poor health conditions and lack of proper diet [19]. Maternal anemia can be asymptomatic and diagnosed by routine tests and screenings. Signs and symptoms are nonspecific with tiredness, fatigue and headache being most common in pregnancy. Mild anemia is curable and not have adverse effects, but moderate and severe anemia significantly disturbs maternal health adverse effects of anemia are significant in pregnancy and it can equally affect the health of children in future. Mild anemia has common pregnancy symptoms of headache, fatigue, and lethargy but when it remains untreated, it shows severe prominent symptoms which may include inhibited fetus growth, low infant weight, burning sensation of tongue or Pica, lassitude, feeling of exhaustion, anorexia indigestion and swelling of legs [20]. In addition to these signs severe anemia has clinical signs of tachycardia, tachypnea, pallor, glossitis and cheilitis (inflammation of lips). Due to these symptoms, both maternal and neonatal health get affected [13].

3. Effects of Maternal Anemia

Usually maternal anemia may result in:

- Maternal and fetal death in early pregnancy
- Miscarriage
- Premature birth

Reported data supports that high mortality rate is observed in neonates of anemic mothers. Recent studies revealed that maternal anemia differently effect male and female fetuses. Male fetus institute strategies that help in their normal growth in adverse condition put them at risk in stress-full event of labor [21, 22]. The most common type of anemia is iron-deficiency anemia results in decrease of blood hemoglobin concentration. Moreover, in developing countries like Pakistan, geographical area, diet and season decide the type of anemia, it may be iron deficiency, foliate deficiency and vitamin deficiency. Both mother and fetus can be affected by iron deficiency anemia (IDA). During gestation period, there are several possible exposures on mother including short term memory loss, decrease attention span, decrease performance at work, increase fatigue, low hemoglobin concentration and low oxygen saturation levels in uterus, placenta and fetus, reduce tolerance to significant blood loss and surgical intervention during labor [23, 24]. Whereas statically significant rise in both

cognitive and behavioral abnormalities are shown by iron deficient neonate [25]. In placenta, transferrin is mainly a source to supply iron from mother to fetus. Moreover, iron deficiency may alter normal functioning of dopamine which is responsible for transmitting visual and auditory information [26]. Iron deficiency anemia (IDA) also accounts for declining mental capabilities of some parts of central nervous system (CNS). It has remarkable effects on non-verbal intelligence, parallel to this, reported data highlights that verbal intelligence is not disturbed [27]. Another type of anemia is aplastic anemia which is a bone marrow hypocellularity disease which occurs before the third trimester of gestation period. Hormonal effect, immunity changes and decreased marrow reservoir are important factors of aplastic anemia [28]. Severity of aplastic anemia may affect oxygen and lead to PET (Pre-eclampsia), acute heart failure and restricted fetal growth [29]. As maternal mild anemia in 3rd trimester associates with higher fetal birth weight so female newborn is accessed by reduced amount of maternal hemoglobin in gestation phase.

Table 1: Frequency of Maternal Anemia in different provinces of Pakistan

Province	Mild	Moderate	Severe	Reference(s)
Punjab	39.8	19.2	6.4	[30]
Sindh	37.9	49.1	0.7	[31]
KPK	90	72	02	[32-34]
Baluchistan	46.1	8.6	1.3	[35]

Similarly, newborn delivered by mild anemic mother are heavier than control [36-38]. Pregnant women with aplastic anemia not only have maternal and fetal complications like thrombocytopenia but also obstetric ones. Aplastic anemia may affect oxygen level and lead to PET (pre-eclampsia), acute heart failure, fetal growth restrictions, fetal demise (intrauterine death after five months of pregnancy) and even neonate demise [39].

4. Situations in Pakistan

In developing countries frequency of maternal anemia cases is considerably high. Pakistan is also included in the list of developing countries and considerable percentage of Pakistani women are victims of maternal anemia and their ratio varies in different regions of country (Table.1). A survey reported that 26 % of women belong to urban areas are at verge of facing maternal anemia and a rise can be noted in this percentage up to 47% in women of rural areas [40] and overall 75% of maternal anemic cases are of mild type [41]. Moreover, there are several socioeconomic factors like poverty, improper diet of women during pregnancy, lack of awareness and birth control which are contributing a lot in to enhance the frequency of maternal anemia in Pakistan [42].

5. Prevention and cure

Maternal anemia is a serious disorder as it may lead to many hazardous effects. In time diagnosis, cure and prevention are public goals having significant values especially in economically poor states [43].

6. Diagnosis

Prior to all, accurate diagnosis of the disease is necessary. If differential diagnosis is not performed, the disease cannot be treated properly [43]. During gestation period most of the women suffer from anemia [44, 45]. In more cases, iron deficiency is declared as anemia. But iron deficiency during gestation period and maternal anemia are two different conditions [46]. Iron deficiency during pregnancy may cause anemia but it is not always correlated with maternal anemia [47-51]. In pregnant women, iron deficiency is 2.5 times more than anemia. Hemoglobin level and hematocrit (percentage of red blood cells volume) facilitate the detection of type of anemia [46]. But use of merely hemoglobin level is not enough to diagnose the disease. Other confirmatory tests should also be performed to identify the type of anemia [52, 53].

7. Dietary preventions

An adequate dietary intake is a remedial practice to decrease the risk of anemia. For example:

- Serum ferritin is lessened in iron deficiency anemia. Its loss can be compensated by the in-take of iron rich diet. The sources of such dietary supplements are:

(a) Ferrous iron can be obtained from animal food.

(b) Ferric iron can be obtained from plant food [54, 55].

- The consumption of milk sugar, wheat flour with iron and folic acid can decrease the risk of anemia.
- By eating food cooked in cast iron utensils, the concentration of iron in diet can be enhanced [56].
- It is reported that during pregnancy, intake of red meat increases the mean hemoglobin concentration.
- Excess consumption of eggs and fruits during the gestation period also decrease risk of anemia.

Similarly following exposures should be avoid minimizing the chances of anemia:

- Women should abstain from the consumption of tea twice or thrice a day during or prior to pregnancy because it can accelerate the risk of anemia as it diminishes the hemoglobin level of blood.

- Contact with dirt and clay can also decline hemoglobin concentration of blood [57].

8. Cure

Drugs can be used as a remedy for the treatment of anemia. In this regard, carbonyl iron is better to use in iron deficiency anemia. Cyanocobalamin is the source of vitamin B12, used in case of folic acid deficiency to treat.

Darbepoetin alfa and epoetin beta-methoxy polyethylene glycol cure anemia as they are erythropoiesis stimulating agents and are specifically recommended to anemic patients. L-methylofolate is prescribed to the patients with low RBCs as it accelerates the production of red blood cells in patients' body. Multivitamins based combinations are also used to overcome vitamin deficiency and can act as a reliever for anemic patients [3].

9. Conclusion

In Pakistan, there is a considerable prevalence of maternal anemia, especially during third trimester which significantly affects the mother and fetus health during gestation period [58]. So general public awareness related to maternal anemia should be promoted to control its alarming frequency.

10. Author's contribution

The authors organized concerned data of Pakistan of last ten years and used to write the manuscript. All the authors revised and approved the final manuscript.

References

[1]. World Health Organization (WHO). The Prevalence of Anemia in women: a tabulation of available information. Geneva, Switzerland: WHO; 1992/MCH/MSM/92.2.

[2]. Kalaivani K, 2009. Prevalence & consequences of anemia in pregnancy. Indian J Med Res., 130 :627–33.

[3]. Sabina S, S Iftequar, Z Zaheer, MM Khan and S Khan, 2015. An Overview of Anemia in Pregnancy. JIPBS, 2 (2): 144-151.

[4]. Chowdhury S, M Rahman and ABM Moniruddin, 2014. Anemia in pregnancy. Medicine Today, 26(1): 49-52.

[5]. Esmat B, R Mohammad, S Behnam, S Motaghipisheh, S Tayeri, M Arab, S Salahi and H Ali-Akbar, 2010. Prevalence of iron deficiency anemia among Iranian pregnant women. Journal of Reproduction and Infertility, 11(1): 17–24.

[6]. Balarajan Y, U Ramakrishnan, E Ozaltin, AH Shankar and SV Subramanian, 2011. Anemia in low-income and middle-income countries. Lancet, 378 (9809): 2123–2135.

[7]. Salhan S, V Tripathi, R Singh and HS Gaikwad, 2011. Evaluation of hematological parameters in partial exchange and packed cell transfusion in treatment of severe anemia in pregnancy. Anemia,1: 1-7.

[8]. Issaragrisil S, DW Kaufman, T Anderson, K Chansung, PE Leaverton, S Shapiro, and NS Young, 2006. The epidemiology of aplastic anemia in Thailand. Blood, 107:1299–307.

[9]. Montane E, L Ibanez, X Vidal, E Ballarín, R Puig, N García, JR Laporte, 2008. Epidemiology of aplastic anemia. Haematologica, 93: 518–23.

[10]. Marsh JCW, SE Ball, J Cavenagh, P Darbyshire, I Dokal , EC Gordon- Smith, J Keidan, A Laurie, A Martin, J Mercieca, SB Killick , R Stewart, JAL Yin, 2009. Guidelines for the diagnosis and management of aplastic anemia. Br J Haematol., 147: 43–70.

[11]. Capoor I and J Gade, 2000. Paper presented at the World Congress on Women's Health on November 10th, 11th & 12th, 2000 at Science City, Calcutta.

[12]. Haider JA and RS Pobocik, 2009. Iron deficiency anemia is not a rare problem among women of reproductive ages in Ethiopia. BMC Blood Disord, 9(7): 1-8.

[13]. Fatemeh M, E Nahid, G Sedigheh and M Jamileh, 2008. Prevalence of anemia risk factors in pregnant women in Kerman, Iran. Iranian Journal Of reproductive Medicine, 8(2): 66-69.

[14]. Balarajan Y, U Ramakrishnan, E A-zaltin, AH Shankar and SV Subramanian, 2013. Anemia in low-income and middle-income countries. Lancet, 378 :0140-6736.

[15]. Souza AI and M Batista-Filho, 2003. Diagnosis and treatment of nutritional anemia in pregnancy. Rev Bras Saúde Matern Infant., 3: 473-47.

[16]. Gebremedhin S and F Enquselassie, 2005. Correlates of anemia among women of reproductive age in Ethiopia. Ethiopian J Health Dev., 25(1): 22-30.

[17]. Verhoeff FH, BJ Brabin, L Chimsuku, P Kazembe and RL Broadhead, 1999. An analysis of the determinants of anemia in pregnant women in rural Malawi. Annals of Tropical Medicine and Parasitology, 93: 119-133.

[18]. Bekele A, M Tilahun and A Mekuria, 2016. Prevalence of anemia and its associated factors among pregnant women attending antenatal care in health institutions of Arba Minch Town, Gamo Gofa Zone, Ethiopia. Anemia, 1: 1073-192.

[19]. Lone FW, RN Qureshi and F Emanuel, 2004. Maternal anemia and its impact on perinatal outcome. Tropical Medicine & International Health, 9: 486-490.

[20]. TDHS (2005) Tanzania Demographic and Health Survey 2004-2005. Dar es Salaam, Tanzania: National Bureau of Statistics and ORC Macro.

[21]. Challis J, J Newnham, F Petraglia, M Yeganegi and A Bocking, 2013. Fetal sex and preterm birth. Placenta, 34: 95-9.

[22]. Torricelli M, C Voltolini, FL Vellucci, N Conti, C Bocchi, FM Severi, JR Challis, R Smith and F Petraglia, 2013. Fetal gender effects on induction of labor in postdate pregnancies. Reprod Sci., 20: 670-4.

[23]. Hercberg S, P Preziosi and P Galan, 2001. Iron deficiency in Europe. Public Health Nutr., 4(2B): 537–545.

[24]. Zimmermann MB and RF Hurrell, 2007. Nutritional iron deficiency. Lancet, 370: 511–520.

[25]. Congdon EL, A Westerlund, CR Algarin, D Patricio, Peirano, M Gregas, B Lozoff and CA Nelson, 2012. Iron deficiency in infancy is associated with altered neural correlates of recognition memory at 10 years. J. Pediatr.,160(6): 1027–1033.

[26]. Antal A, S Keri and J Bodis-Wollner, 1997. Dopamine D2 receptor blockade alters the primary and cognitive components of visual evoked potentials in the monkey, Macaca fascicularis. Neurosci Lett., 232(3):179-81.

[27]. Iqbal K, T Zafar, Z Iqbal, M Usman, H Bibi, MS Afreen and J Iqbal, 2015. Effect of iron deficiency anemia on intellectual performance of primary school children in Islamabad. Pakistan Tropical Journal of Pharmaceutical Research, 2: 287-291.

[28]. Mandal AK, A Nicholas, E Wrigley, RE Hopkins, 2005. Case of aplastic anemia in pregnancy. J

Obstetr Gynaecol., 25: 66– 7.

[29]. Young NS, 2013. Current concepts in the pathophysiology and treatment of aplastic anemia. Education Program of the American Society of Hematology, 1: 76–81.

[30]. Hameed H, A Hameed, S Bashir, S Akram, M Arshad and R Afzal, 2018. Study of prevalence of anemia among pregnant women and its correlation with different risk factors. Drug Designing, 7:1-5.

[31]. Parks S, AMK Hoffman, ASS Goudar, BA Patel, CS Saleem, DSA Ali, DRL Goldenberg, EPL Hibberd, FJ Moore, GD Wallace, GEM Mcclure and Derman RJ, 2019. Maternal anemia and maternal, fetal, and neonatal outcomes in a prospective cohort study in India and Pakistan. BJOG,126(6): 737–743.

[32]. Chaoui A, M Faid and R Belhcen, 2003. Effect of natural starters used for sourdough bread in Morocco on phytate biodegradation. East Mediterr Health J., 9: 141–7.

[33]. Allen L, B de Benoist, O Dary and R Hurrel, 2006. Guidelines on food fortification with micronutrients. Geneva. World Health Organization.

[34]. Shah FJ, A Fareed, WU Zakori, I Ullah, IU Haq and H Khan, 2018. Frequency and outcome of adolescent pregnancy in population of Peshawar. Pakistan Postgraduate Medical Journal, 29(1): 8-12.

[35]. Bibi A, A Kakar, F Shahwani and F Iqbal,2019. Frequency of anemia in pregnant women of different age groups at Quetta: A hospital-based cross-sectional study. Pure Appl. Biol., 8(2): 1043-1050.

[36]. Ervasti M, U Sankilampi, S Heinonen and K Punnonen, 2009. Early signs of maternal iron deficiency do not influence the iron status of the newborn but are associated with higher infant birthweight. Acta Obstet Gynecol Scand., 88: 83-90.

[37]. Bánhidy F, N Acs, EH Puhó and AE Czeizel, 2011. Iron deficiency anemia: pregnancy outcomes with or without iron supplementation. Nutrition, 27: 65-72.

[38]. Kaur M, AM Chauhan and MM Rajput, 2015. Maternal anemia and neonatal outcome, a prospective study on urban pregnant women. J Clin Diagn Res, 9: 4-8.

[39]. Bo L, L Mei-Ying, Z Yang, W Shan-Mi and Z Xiao-Hong, 2016. Aplastic anemia associated with pregnancy. J Maternal Fetal and Neonatal Medicine, 29(7): 1122-1124.

[40]. Pakistan Medical Research Council. National Health Survey of Pakistan 1990–94. Islamabad: Network Publishing Service, 1998.

[41]. Seshadri S, 2001. Prevalence of micronutrient deficiency particularly of iron, zinc and folic acid in pregnant women in South East Asia. Br J Nutr., 85(2): S87–92.

[42]. Harding KL, VM Aguayo, G Namirembe and P Webb, 2018. Matern Child Nutr.;14(S4): e12478: 1-13.

[43]. Figueredo GF, Silva, Cruz and Pereira, 2018. Maternal anemia and iron deficiency anemia similarities and singularities. Health Care Current Reviews, 6 (1): 2375-4273.

[44]. Cao C and KO O'Brien, 2013. Pregnancy and iron homeostasis: an update. Nutr. Rev., 71(1): 35–51.

[45]. Burke RM, JS Leon and PS Sukhdev, 2014. Identification, prevention and treatment of iron deficiency during the first 1000 days. Nutrients, 6(10): 4093–4114.

[46]. Matos JF, LMSA Dusse and KBG Gomes, 2012. Blood tests in microcytic and hypochromic anemia. J Bras Patol Med Lab., 48(4): 255-258.

[47]. Casanova BF, MD Sammel and GA Macones, 2005. Development of a clinical prediction rule for iron

deficiency anemia in pregnancy. Am J Obstet Gynecol., 193: 460-466.

[48]. Black RE, CG Victora and SP Walker, 2013. Maternal and child under nutrition and overweight in low-income and middle-income countries. Lancet, 82: 427-451.

[49]. Bencaiova G and C Breymann, 2014. Mild anemia and pregnancy outcome in a Swiss collective. J Pregnancy, 1: 1-7.

[50]. Banjari I, D Kenjerić and ML Mandić, 2015. What is the real public health significance of iron deficiency and iron deficiency anemia in Croatia? A population-based observational study on pregnant women at early pregnancy from eastern Croatia. Cent Eur J Public Health, 23: 98-1.

[51]. Menon KC, EL Ferguson and CD Thomson, 2016. Effects of anemia at different stages of gestation on infant outcomes. Nutrition, 32(1): 61-65.

[52]. Bresani, CC, AL Souza and M Batista-Filho, 2007. Anemia and iron deficiency in pregnant women. Rev Bras Saúde Matern Infant, 7: S15-S21.

[53]. Qi L, RM Van Dam and K Rexrode, 2007. Heme iron from diet as a risk factor for coronary heart disease in women with type 2 diabetes. Diabetes Care, 30: 101-106.

[54]. Donovan A, C Roy and N Andrews, 2006. The ins and outs of iron homeostasis. Physiology, 21: 115-23.

[55]. Bresani CC, MC Braga and DF Felisberto, 2013. Accuracy of erythrogram and serum ferritin for the maternal anemia diagnosis (AMA): A phase 3 diagnostic study on prediction of the therapeutic responsiveness to oral iron in pregnancy. BMC Pregnancy Childbirth, 13: 13.

[56]. Hoffbrand A, F Pettit and P Moss, 2006. Essential hematology. 5th edition. Malden, Mass.; Oxford: Blackwell Pub., - Essential series. pp: 346-51.

[57]. Ansari NB, SH Badruddin, R Karmaliani, H Harris, I Jehan, O Pasha, N Moss, EM McClure and L Robert, 2008. Anemia prevalence and risk factors in pregnant women in an urban area of Pakistan. Food and Nutrition Bulletin, 29(2): 132-139.

[58]. Rizwan F, Qamarunisa, Habibullah and A Memon, 2010. Prevalence of anemia in pregnant women and its effects on maternal and fetal morbidity and mortality. Pak J Med Sci, 26(1):92-95.