



Relationship of age at menarche, coitarche and first gestation: A retrospective cohort analysis

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ABSTRACT

Introduction: Teenage pregnancy is defined as a pregnancy occurring between ages 10 and 19 (Loredo-Abdlá et al., 2017; Belitzky, 1985; Kaplanoglu et al., 2015), and is associated with increased morbidity and mortality for both mother and child. Several factors have been identified with increased risk of a teenage pregnancy, including incomplete sexual education awareness and increased exposure at a young age. In addition, an earlier onset of sexual intercourse, or coitarche, has been linked to a higher risk of teenage pregnancy. Early menarche, defined as first menstruation before the age of 12 has been previously identified as a risk factor for an earlier coitarche, possibly linking an early menarche with a higher incidence of teenage pregnancy. This study aims to compare and determine the relationship between the incidence of teenage pregnancy with early menarche and coitarche in a low income setting.

Design, Setting, Participants, Interventions, Main Outcome, Measures: A cross sectional review of electronic records of women admitted for delivery in a second level center in northeastern Mexico, being a low-income setting, where 814 teenage and 1474 adult mothers were included.

Results: Primigravid teenagers had earlier menarche and coitarche than adult counterparts and opted for post-partum contraception more frequently. Linear regression analysis revealed significant unadjusted beta coefficients between age at first pregnancy and coitarche (0.839) and menarche (0.362). Menarche and coitarche had a significant linear regression association of 0.395.

Conclusion: We found amongst primigravid patients that teenagers had earlier menarche and coitarche than adults, which in turn correlated to their age at their first pregnancy.

Introduction

Teenage pregnancy is defined as pregnancy in patients younger than 19 years, and constitutes an important public health issue with medicolegal, socioeconomic, and emotional implications [1–3]. It's currently a major problem in low and middle-income countries, where approximately 16 million adolescents between ages 15 and 19 give birth every year, as well as about a million of girls under the age of 15 [4,5].

According to World Bank data 36 out of every 1000 adolescents between ages 15 and 19 in the United States become pregnant. In contrast, 69 out of 1000 adolescents in Mexico do, while other Latin American countries with comparable economic development status, such as Brazil, Argentina and Chile show similar rates of 76 per 1000, 56

of 1000 and 57 per 1000, respectively. Teenage pregnancy has been linked to socioeconomic status. Some authors have even hypothesized teenage childbearing as one of the reasons for intergenerational transmission of poverty [4,6].

Several factors such as education awareness and increased exposure at a young age have been associated with increased risk for teenage pregnancy. In addition, an earlier onset of sexual intercourse, or coitarche, has been significantly linked to a higher risk of teenage pregnancy [7–11,5,12–18].

In some cultures menarche is regarded as the rite to womanhood. An early menarche can lead to an early coitarche, possibly linking an early menarche with a higher incidence of teenage pregnancy [19]. This study aims to determine if there is a relationship between the onset of

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menarche, coitarche and age at first gestation in a low income setting.

Materials and methods

With IRB approval – HMBSSSNL – 2017/871, and thorough adherence to institutional, national Mexican General HealthLaw’s (Ley General de Salud en Materia de Investigaci_ on para la Salud) Article 17 we performed a retrospective ERM review of primigravid women admitted for delivery in a 2nd evel center in northeastern Mexico was conducted from January to June of 2018. Every pregnant patient admitted for labor and delivery, with at least 20 weeks of gestation by last menstruation date were included in this study.

Normality was assessed through the Shapiro-Wil test. Continuous variables are expressed as mean and standard deviation or median and interquartile range (IQR) according to their distribution and tested using T-Student test or ANOVA with Tukey’s Post-Hoc or Mann-Whitney-U and Kruskall-Wallis tests respectively. Count data are expressed and frequencies and percentage. Univariate and multivariate binomial logistic regressions were performed to assess the associations between selected variables. Omnibus tests of model coefficients and Hosmer and Lemshow’s test of data fitness were used to assess the models. Results are expressed as odds ratios (OR) and 95 % confidence intervals (CI). We used an alpha of 5 % as the threshold for statistical significance. Data was analyzed using SPSS v25.

Results

Of 2288 consecutive patients attending for delivery, 906 were primigravid. Of these included patients, 63.9 % (579) were teenagers and 36.1 % (327) were adults, resulting in a median age of 17 and 22, respectively.

Relationship status

In the adolescent group, 82.4 % (477) had a free union marital status with their partner, while 14.7 % (85) were single, and only 2.9 % (17) were married. In contrast, the adult group had a lower percentage of free union and single patients of 77.7 % (254) and 12.5 % (41), respectively, and a higher percentage of married patients, with 9.8 % (32) of adult patients being married. These findings are summarized in [Table 1](#).

Gynecological history

The median age of menarche was 12 (6–23) in the adolescent group and 13 (9–18) in the adult group, while the median age of coitarche for both groups was 16 and 18, respectively. Teenage patients had a lower median age at menarche and coitarche. Linear regression analysis revealed significant unadjusted beta coefficients between age at first pregnancy and coitarche (0.839) and menarche (0.362). Menarche and coitarche had a significant linear regression association of 0.395. These findings are summarized in [Table 2](#).

Postpartum findings

Regarding delivery methods and postpartum birth control, (129) 22.3 % of the adolescent group had a C-Section performed, (370) 63.9 % had a vaginal delivery partum and (80) 13.8 % who had obstructed labor were categorized as labor dystocia. Of this group, (449) 77.8 % used an IUD as their birth control method after labor, (3) 0.5 % had bilateral salpingectomy and (125) 21.7 % opted for no method. In contrast, (91) 27.8 % of the adult group had a C-Section, (199) 60.9 % underwent vaginal delivery and (37) 11.3 % had labor dystocia. (190) 58.1 % used IUD, (5) 1.5 % had bilateral salpingectomy, (1) 0.3 % a subdermal implant and (131) 40.1 % opted for none. Overall baseline and outcomes are detailed in [Table 1](#).

Table 1

Summarizes statistical comparisons between adolescent and adult patients across key demographic, baseline and postpartum variables.

Variable	Adolescent	Adult	
Age ^a	17 (13-19)	22 (20-40)	0.001
Relationship status:†			
• Free union	• 477 (82.4 %)	• 254 (77.7 %)	0.001
• Single	• 85 (14.7 %)	• 41 (12.5 %)	
• Married	• 17 (2.9 %)	• 32 (9.8 %)	
Menarche ^a	12 (6-23)	13 (9-18)	0.001
Coitarche ^a	16 (6-22)	18 (13-35)	0.001
Gestational Hypertensive Disease:†	52 (9 %)	35 (10.7 %)	0.398
Fetal Growth Restriction:†	7 (1.2 %)	4 (1.2 %)	0.985
Oligohydramnios:†	16 (2.8 %)	10 (3.1 %)	0.799
Polyhydramnios:†	0 (0 %)	0 (0 %)	
Delivery method:†			
• C-Section	• 129 (22.3 %)	• 91 (27.8 %)	0.137
• Vaginal Delivery	• 370 (63.9 %)	• 199 (60.9 %)	
• Dystocia	• 80 (13.8 %)	• 37 (11.3 %)	
Birth Weight (g) ^a	3140 (490-4350)	3105 (670-4770)	0.802
Birth Control:†			
• None	• 125 (21.7 %)	• 131 (40.1 %)	0.001
• IUD	• 449 (77.8)	• 190 (58.1 %)	
• Bilateral Salpingectomy	• 0 (0.0 %)	• 5 (1.5 %)	
• Implant	• 0 (0.0 %)	• 1 (0.3 %)	
• Hormonal	• 0 (0.0 %)	• 0 (0.0 %)	
• Hysterectomy	• 0 (0.0 %)	• 0 (0.0 %)	
Hemorrhage:†	8 (1.4 %)	4 (1.2 %)	00.841
Obstetrical Trauma:†			
• None	• 441 (76.2 %)	• 247 (75.5 %)	0.642
• Grade 1-2	• 126 (21.8 %)	• 68 (20.8)	
• Grade 3	• 3 (0.5 %)	• 5 (1.5 %)	
• Grade 4	• 4 (0.7 %)	• 4 (1.2 %)	
• Hematoma	• 4 (0.7 %)	• 2 (0.6 %)	

† Denotes testing was done using Chi-Square

^a Denotes testing was done using Mann-Whitney-U

Table 2

Linear Regression Table analyzing the relationship between age at first pregnancy with coitarche and menarche.(TOP) and pearson correlation(BOTTOM).

Variable	coefficient	p value	Adjusted coefficient	p value
Menarche	0.362,	0.001	0.013,	0.651
Coitarche	0.839,	0.001	0.558,	0.001
Coitarche/Menarche	0.395,	0.001		

Discussion

This study compared the relationship, as established through linear regression modeling of age at first pregnancy with coitarche and menarche in patients from low socioeconomic status from a third world country. Our data suggests that earlier onset of menarche is associated with earlier coitarche as well as a younger age at first pregnancy.

Prior research has shown that adolescents that have their first sexual intercourse (FSI) at a young age may have an increased tendency for risky behaviors such as inconsistent contraceptive use, unprotected intercourse, and multiple partners, thus increasing likelihood of an unplanned teenage pregnancy [20–23]. Marino et al. studied the relationship between age at menarche and age at first sexual intercourse in Australian adolescents, and while previous studies had concluded there was a direct relationship between these two, they concluded that a younger age at menarche was not a risk factor for younger age at FSI [20]. Similar studies from developing nations in addition to our own have contested this finding. Teenage pregnancy is a complex socio-cultural as well as health-related phenomenon susceptible to a multitude of difficult to account for factors [24–54]. Nationwide access to healthcare, sexual literacy, cultural implications of sexual intercourse as well as the perceived role of biologically female women can have a

significant impact. A study from the U.S. by Mark et al. found that counties that had more comprehensive sexual education had ~3 % decreased teenage pregnancy rates [55]. Additional factors such as religious practices and religiosity have been shown to impact access to sexual education and sexual practices in both teenagers and adults [56–58].

Data from developing countries is limited, however in this present study we provide analysis from a third-level state-wide referral center with a large patient population. Our data suggests there is a significant statistical relationship between a younger age of menarche and younger age at FSI. Teenage mothers had a median age of 12 years old at menarche, whereas adult mothers had a median age of 13 years old. Similarly, teenage and adult mothers had a median of 16 and 18 years old at FSI, respectively ($p < 0.0001$). As previously stated, Age and Menarche showed a correlation index of 0.362 while Age and Coitarche showed a correlation index of 0.839. This relationship is also supported by a similar study on sociodemographic characteristics of pregnant adolescents in Mexico, where teenage pregnancy was as high as 69 out of every 1000 live births [4,59]. The mean age of menarche was 11.7 ± 1.4 years and the age of FSI was 15.0 ± 1.3 years.

It must also be noted whether said pregnancies were planned or not. According to the World Health Organization (WHO), three out of every four teenage pregnancies are unplanned [5]. Estrada et al. have studied factors associated with planned pregnancies amongst teenagers, concluding that older teenagers and those in relationships were most likely to have planned their pregnancy, while younger teenagers and those without a stable partner were less likely [60]. Although the use of contraception among adolescents has increased significantly over the last 20 years [61], teenagers are considerably less likely to use modern contraceptives (intrauterine devices, subdermal implants, patch, sterilization) and more likely to have unfulfilled needs for family planning, supporting an existing disparity between adolescent and adult women [62]. Notably however, a higher proportion of teenagers, compared to adults elected to undergo contraception using a IUD. While no related data was conducted as to the reasons underlying the choice of contraception, it could be assumed that teenagers were more likely to have unplanned first pregnancies and elected to undergo IUD placement as a contraceptive method to avoid any further pregnancy, compared to adults who more frequently elected not to undergo contraception due to planning more children. Adults were also more frequently married and less frequently single, suggesting that the underlying circumstances of pregnancy being planned with a stable partner as a factor in their desire to not undergo further contraception [63–68].

The impact of socioeconomic status, religiosity, and other social and cultural factors has not been explored in this pilot study and further studies should seek to further clarify the impact these variables have on teenage pregnancy. Ideally, studies should compare cohorts of teenage pregnant patients in different settings related to access to healthcare and in addition perform qualitative studies determining pregnancy planning and access to contraception and education.

This study is limited by its socioeconomic settings and low prenatal control, which might limit the results external validity, however rerun of analysis including patients with minimal adequate control showed no differences. Further studies in larger cohorts from mixed settings may provide more evidence.

Conclusion

In our retrospective cohort analysis, notable trends amongst primigravid patients showed teenagers had earlier menarche and coitarche, which was correlated to their age at their first pregnancy.

- The median age of menarche and coitarche are younger in primigravid teenagers than in primigravid adults.
- Primigravid teenagers are more frequently single.

- There's a strong association between age at menarche with age at coitarche.
- There's a strong association between menarche, coitarche and age at first pregnancy.

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Conflict of Interest

None to disclose.

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References

- [1] Loredó-Abdlá A, Vargas-Campuzano E, Casas-Muñoz A, González-Corona J, Gutiérrez-Leyva CJ. Embarazo adolescente: sus causas y repercusiones en la diada. *Rev Med Del IMSS* 2017. <https://doi.org/10.1017/CBO9781107415324.004>.
- [2] Belitzky R. Resultados perinatales en madres jóvenes: estudio comparativo en maternidades latinoamericanas. *La Salud Del Adolescente Y el Joven - En las Américas Wash* 1985.
- [3] Kaplanoglu M, Bülbül M, Konca C, Kaplanoglu D, Tabak MS, Ata B. Gynecologic age is an important risk factor for obstetric and perinatal outcomes in adolescent pregnancies. *Women Birth* 2015. <https://doi.org/10.1016/j.wombi.2015.07.002>.
- [4] Adolescent fertility rate (births per 1,000 women ages 15–19), World Bank Data. (<https://data.worldbank.org/indicator/SP.ADO.TFR.T>).
- [5] WHO. Global health estimates 2015: deaths by cause, age, sex, by country and by region, 2000–2015. Geneva: WHO; 2016.
- [6] La-Orpipat T, Suwanrath C. Pregnancy outcomes of adolescent primigravida and risk of pregnancy-induced hypertension: a hospital-based study in Southern Thailand. *J Obstet Gynaecol* 2019. <https://doi.org/10.1080/01443615.2019.1581736>.
- [7] Darroch J, Woog V, Bankole A, Ashford LS. Adding it up: costs and benefits of meeting the contraceptive needs of adolescents. New York: Guttmacher Institute; 2016.
- [8] Neal S., Matthews Z., Frost M., Fogstad H., Camacho A.V., Laski L. Childbearing in adolescents aged 12–15 years in low resource countries: a neglected issue. New estimates from demographic and household surveys in 42 countries. *Acta Obstet Gynecol Scand*. (2012). Every Woman Every Child. The Global Strategy for Women's, Children's and Adolescents' Health (2016–2030). Geneva: Every Woman Every Child, 2015.
- [9] Azevedo WF, Diniz MB, Fonseca ESVB, Ricarte de Acevedo LM, Evangelista CB. Complications in adolescent pregnancy: systematic review of the literature. *Einst (São Paulo)* 2015. <https://doi.org/10.1590/s1679-45082015rw3127>.
- [10] Michelazzo D, Yazlle ME, Mendes MC, Patta MC, Yazlle Rocha JS, Dias de Moura M. Indicadores sociais de grávidas adolescentes: estudo caso-controlado. *Rev Bras Ginecol Obstet* 2004.
- [11] Iacobelli S, Robillard PY, Gouyon JB, Hulsey TC, Barau G, Bonsante F. Obstetric and neonatal outcomes of adolescent primiparous singleton pregnancies: a cohort study in the South of Reunion Island, Indian Ocean. *J Matern Fetal Neonatal Med* 2012.
- [12] Aquino-Cunha M, Queiroz-Andrade M, Tavares-Neto J, Andrade T. Gestaçao na adolescência: relação com o baixo peso ao nascer. *Rev Bras Ginecol Obstet* , 2002.
- [13] Rocha RC, Souza E, Guazzelli CA, Chambô Filho A, Pereira Soares E, da Silva Nogueira E. Prematuridade e baixo peso entre recém-nascidos de adolescentes primíparas. *Rev Bras Ginecol Obstet* 2006.
- [14] Chalem E, Mitsuhiro SS, Ferri CP, Moraes Barros MC, Guinsburg R, Laranjeira R. Gravidez na adolescência: perfil sócio-demográfico e comportamental de uma população da periferia de São Paulo. *Brasil. Cad Saude Publica* 2007.
- [15] Karataşlı V, Kanmaz AG, Hamdi İnan A, Budak A, Beyan E. Maternal and neonatal outcomes of adolescent pregnancy. *J Gynecol Obstet Hum Reprod* 2019. <https://doi.org/10.1016/j.jogoh.2019.02.011>.
- [16] Raj A, Boehmer U. Girl child marriage and its association with national rates of HIV, maternal health, and infant mortality across 97 countries. *Violence Women* 2013.
- [17] WHO. Global standards for quality health care services for adolescents. Geneva: WHO; 2015.
- [18] Arceo-Gomez EO, Campos-Vazquez RM. Teenage pregnancy in Mexico: evolution and consequences. *Lat Am J Econ* 2014. <https://doi.org/10.7764/LAJE.51.1.109>.
- [19] Romans SE, Martin JM, Gendall K, Herbison GP. Age of menarche: the role of some psychosocial factors. *Psychol Med* 2003;33(5):933–9.

- [20] Marino JL, Skinner SR, Doherty DA, Rosenthal SL, Cooper Robbins SC, Cannon J. Age at menarche and age at first sexual intercourse: a prospective cohort study. *Pediatrics* 2013. <https://doi.org/10.1542/peds.2012-3634>.
- [21] Cavazos-Rehg PA, Krauss MJ, Spitznagel EL, Schootman M, Peipert JF, Cottler LB, et al. Type of contraception method used at last intercourse and associations with health risk behaviors among US adolescents. *Contraception* 2010.
- [22] Magnusson BM, Masho SW, Lapan KL. Early age at first intercourse and subsequent gaps in contraceptive use. *J Women's Health (Larchmt)* 2012.
- [23] Langille DB, Asbridge M, Flowerdew G, Allen M. Associations of sexual risk-taking with having intercourse before 15 years in adolescent females in Cape Breton, Nova Scotia, Canada. *Sex Health* 2010;7(2):199–204.
- [24] Ezegwui HU, Ikeako LC, Ogbuefi F. Obstetric outcome of teenage pregnancies at a tertiary hospital in Enugu, Nigeria. *Niger J Clin Pr* 2012. <https://doi.org/10.4103/1119-3077.97289>.
- [25] Lee SH, Lee SM, Lim NG, Kim HJ, Bae SH, Ock M, et al. Differences in pregnancy outcomes, prenatal care utilization, and maternal complications between teenagers and adult women in Korea. *Medicine* 2016. <https://doi.org/10.1097/MD.0000000000004630>.
- [26] Cavazos-Rehg PA, Krauss MJ, Spitznagel EL, Bommarito K, Madden T, Olsen MA, et al. Maternal age and risk of labor and delivery complications. *Matern Child Health J* 2015. <https://doi.org/10.1007/s10995-014-1624-7>.
- [27] Rexhepi M, Besimi F, Rufati N, Alili A, Bajrami S, Ismaili H. Hospital-based study of maternal, perinatal and neonatal outcomes in adolescent pregnancy compared to adult women pregnancy. *Open Access Maced J Med Sci* 2019. <https://doi.org/10.3889/oamjms.2019.210>.
- [28] Bakwa-Kanyinga F, Valério EG, Bosa VL, Alfama CO, Sperb M, Capp E, et al. Adolescent pregnancy: maternal and fetal outcomes in patients with and without preeclampsia. *Pregnancy Hypertens* 2017. <https://doi.org/10.1016/j.preghy.2017.06.009>.
- [29] Macedo TC, Montagna E, Trevisan CM, Zaia V, de Oliveira R, Barbosa CP, et al. Prevalence of preeclampsia and eclampsia in adolescent pregnancy: a systematic review and meta-analysis of 291,247 adolescents worldwide since 1969. *Eur J Obstet Gynecol Reprod Biol* 2020. <https://doi.org/10.1016/j.ejogrb.2020.03.043>.
- [30] Grønvik T, Fossgard Sandøy I. Complications associated with adolescent childbearing in Sub-Saharan Africa: a systematic literature review and meta-analysis. *PLoS One* 2018.
- [31] Leppälähti S, Gissler M, Mentula M, Heikinheim O. Is teenage pregnancy an obstetric risk in a welfare society? a population-based study in Finland, from 2006 to 2011. *BMJ Open* 2013.
- [32] Blomberg M, Birch Tyrberg R, Kjølhede P. Impact of maternal age on obstetric and neonatal outcome with emphasis on primiparous adolescents and older women: a Swedish Medical Birth Register Study. *BMJ Open* 2014.
- [33] Ganchimeg T, Ota E, Morisaki N, Laopaiboon M, Lumbiganon P, Zhang J, et al. Pregnancy and childbirth outcomes among adolescent mothers: a World Health Organization multicountry study. *BJOG: Int J Obstet Gynaecol* 2014. <https://doi.org/10.1111/1471-0528.12630>.
- [34] De Vienne CM, Creveuil C, Dreyfus M. Does young maternal age increase the risk of adverse obstetric, fetal and neonatal outcomes: a cohort study. *Eur J Obstet Gynecol Reprod Biol* 2009.
- [35] Zeteroglu S, Sahin I, Gol K. Cesarean delivery rates in adolescent pregnancy. *Eur J Contracept Reprod Health Care* 2005.
- [36] Wilkie GL, Leung K, Kumaraswami T, Barlow E, Moore Simas TA. Effects of obstetric complications on adolescent postpartum contraception and rapid repeat pregnancy. *J Pediatr Adolesc Gynecol* 2016. <https://doi.org/10.1016/j.jpjag.2016.05.002>.
- [37] Medhi R, Das B, Das A, Ahmed M, Bawri S, Rai S. Adverse obstetrical and perinatal outcome in adolescent mothers associated with first birth: a hospital-based case-control study in a tertiary care hospital in North-East India. *Adolesc Health Med Ther* 2016.
- [38] Minjares-Granillo RO, Reza-López SA, Caballero-Valdez S, Levario-Carrillo M, Chávez-Corral DV. Maternal and perinatal outcomes among adolescents and mature women: a hospital-based study in the north of Mexico. *J Pediatr Adolesc Gynecol* 2016.
- [39] Cerqueira-Santos E, Paludo SS, dei Schiro ED, Koller SH. Gravidez na adolescência: análise contextual de risco e proteção. *Psicol Estud* 2010.
- [40] Bouzas I, Miranda AT. Gravidez na adolescência. *Adolesc Saude* 2004.
- [41] Harrison K, Rossiter C, Chong H. Relations between maternal height, fetal birth weight and cephalopelvic disproportion suggest that young Nigerian primigravidae grow during pregnancy. *Br J Obstet Gynaecol* 1985;40–8.
- [42] Ganchimeg T, Mori R, Ota E, Koyanagi A, Gilmour S, Shibuya K, et al. Maternal and perinatal outcomes among nulliparous adolescents in low- and middle-income countries: a multi-country study. *BJOG* 2013;120:1622–33.
- [43] Kirbas A, Gulerman HC, Daglar K. Pregnancy in adolescence: is it an obstetrical risk? *J Pediatr Adolesc Gynecol* 2016. <https://doi.org/10.1016>.
- [44] Dutta I, Joshi P. Maternal and perinatal outcome in teenage vs. Vicenarian primigravidae – a clinical study. *J Clin Diagn Res* 2013. <https://doi.org/10.7860/JCDR/2013/7265.3783>.
- [45] Korencan S, Pinter B, Grebenc M, Verdenik I. The outcomes of pregnancy and childbirth in adolescents in slovenia. *Zdr Varst* 2017. <https://doi.org/10.1515/sjph-2017-0036>.
- [46] Keskinoglu P, Bilgic N, Picakciefe M, Giray H, Karakus N, Gunay T. Perinatal outcomes and risk factors of Turkish adolescent mothers. *J Pediatr Adolesc Gynecol* 2007. <https://doi.org/10.1016/j.jpjag.2006.10.012>.
- [47] Althabe F, Moore JL, Gibbons L, Berrueta M, Goudar SS, Chomba E, et al. Adverse maternal and perinatal outcomes in adolescent pregnancies: the global network's maternal newborn health registry study. *Reprod Health* 2015;12:S8. <https://doi.org/10.1186/1742-4755-12-S2-S8>.
- [48] Wong SPW, Twynstra J, Gilliland JA, Cook JL, Seabrook JA. Risk factors and birth outcomes associated with teenage pregnancy: a canadian sample. *J Pediatr Adolesc Gynecol* 2019. <https://doi.org/10.1016/j.jpjag.2019.10.006>.
- [49] Fleming N, Ng N, Osborne C, Biederman S, Yasseen AS, Dy J. Adolescent pregnancy outcomes in the province of Ontario: a cohort study. *J Obstet Gynaecol Can* 2013; 35:234.
- [50] Tough SC, Svenson LW, Johnston DW, Schopflocher D. Characteristics of preterm delivery and low birthweight among 113,994 infants in Alberta: 1994-1996. *Can J Public Health* 2001;92:276.
- [51] Socolov DG, Iorga M, Caruleanu A, Ilea C, Blidaru I, Boiculescu L. Pregnancy during adolescence and associated risks: an 8-year hospital-based cohort study (2007-2014) in Romania, the country with the highest rate of teenage pregnancy in Europe. *Biomed Res Int* 2017. <https://doi.org/10.1155/2017/9205016>.
- [52] Demirci O, Yilmaz E, Tosun O, Kumru P, Arınkan A, Mahmutoğlu D. Effect of young maternal age on obstetric and perinatal outcomes: results from tertiary center in Turkey. *Balk Med J* 2016. <https://doi.org/10.5152/balkanmedj.2015.150364>.
- [53] Tyrberg RB, Blomberg M, Kjølhede P. Deliveries among teenage women - with emphasis on incidence and mode of delivery: a Swedish national survey from 1973 to 2010. *BMC Pregnancy Childbirth* 2013. <https://doi.org/10.1186/1471-2393-13-204>.
- [54] WHO. Adolescent pregnancy: unmet needs and undone deeds: a review of the literature and programmes. Geneva: WHO; 2007.
- [55] Mark NDE, Wu LL. More comprehensive sex education reduced teen births: quasi-experimental evidence. *e2113144119 Proc Natl Acad Sci USA* 2022;119(8). <https://doi.org/10.1073/pnas.2113144119>.
- [56] Cotton S, Berry D. Religiosity, spirituality, and adolescent sexuality. *Adolesc Med State Art Rev* 2007;18(3). 471-vi.
- [57] de Visser RO, Smith AM, Richters J, Rissel CE. Associations between religiosity and sexuality in a representative sample of Australian adults. *Arch Sex Behav* 2007;36(1):33–46. <https://doi.org/10.1007/s10508-006-9056-0>.
- [58] Lefkowitz ES, Gillen MM, Shearer CL, Boone TL. Religiosity, sexual behaviors, and sexual attitudes during emerging adulthood. *J Sex Res* 2004;41(2):150–9. <https://doi.org/10.1080/00224490409552223>.
- [59] Blanquet-García J, Montoya-Cázar A, Carranza-Lira S. Características sociodemográficas de la adolescente embarazada en un hospital de alta especialidad. *Rev Med Inst Mex Seg Soc* 2016;54(Supl 3). S238-4.
- [60] Estrada F, Suárez-López L, Hubert C, Cruz-Jimenez L. Factors associated with pregnancy desire among adolescent women in five Latin American countries: a multilevel analysis. *BJOG: Int J Obstet Gynaecol* 2018. <https://doi.org/10.1111/1471-0528.15313>.
- [61] Blanc AK, Tsui AO, Croft TN, Trevitt JL. Patterns and trends in adolescents' contraceptive use and discontinuation in developing countries and comparisons with adult women. *Int Fam Plan Perspect* 2009. <https://doi.org/10.1363/3506309>.
- [62] Li Z, Patton G, Sabet F, Zhou Z, Subramanian SV, Lu C. Contraceptive use in adolescent girls and adult women in low- and middle-income countries. *JAMA Netw Open* 2020. <https://doi.org/10.1001/jamanetworkopen.2019.21437>.
- [63] Baldwin M, Edelman A. The effect of long-acting reversible contraception on rapid repeat pregnancy in adolescents: a review. *J Adolesc Health* 2013;52(4):S47–53.
- [64] Grimes D, Lopez L, Schulz K, Van Vilet HA, Stanwood NL. Immediate post-partum insertion of intrauterine devices. *Cochrane Database Syst Rev* 2010.
- [65] Hernandez L, Sappenfield W, Goodman D, Pooler J. Is effective contraceptive use conceived prenatally in Florida? The association between prenatal contraceptive counseling and postpartum contraceptive use. *Matern Child Health J* 2012;423–9.
- [66] De Vargas Nunes Coll C, Ewerling F, Hellwig F, Dornellas de Barros AJ. Contraception in adolescence: the influence of parity and marital status on contraceptive use in 73 low-and middle-income countries. *Reprod Health* 2019. <https://doi.org/10.1186/s12978-019-0686-9>.
- [67] Ngome E, Odimegwu C. The social context of adolescent women's use of modern contraceptives in Zimbabwe: a multilevel analysis. *Reprod Health* 2014;11:64.
- [68] Ochako R, Mbono M, Aloo S, Kaimenyi S, Thompson R, Temmerman M, et al. Barriers to modern contraceptive methods uptake among young women in Kenya: a qualitative study. *BMC Public Health* 2015;15:118.