

Prevalence of teenage pregnancy in 2015–2016 and its obstetric outcomes compared to non-teenage pregnancy at Hospital Tuanku Ja'afar Seremban (HTJS), Negeri Sembilan, Malaysia: A retrospective case-control study based on the national obstetric registry

Nagandla K, Kumar K

Nagandla K, Kumar K. Prevalence of teenage pregnancy in 2015–2016 and its obstetric outcomes compared to non-teenage pregnancy at Hospital Tuanku Ja'afar Seremban (HTJS), Negeri Sembilan, Malaysia: A retrospective case-control study based on the national obstetric registry. *Malays Fam Physician*. 2020;15(2):2–9.

Keywords:

Teenage pregnancies, prevalence, obstetric outcomes, perinatal outcomes

Authors:

Kavitha Nagandla

(Corresponding author)
Department of Obstetrics & Gynecology, International Medical University, Seremban

Krishna Kumar

Department of Obstetrics & Gynecology, Hospital Tuanku Ja'afar Seremban, Seremban

Abstract

Objective: To determine the prevalence of teenage pregnancy and compare its obstetric and perinatal outcomes with those of non-teenage pregnancy.

Method: This retrospective hospital-based case-control study was conducted in the Department of Obstetrics and Gynaecology in Hospital Tuanku Ja'afar Seremban. The study made use of the Malaysian National Obstetric Registry (NOR) records of teenage pregnant women aged 11–19 at Hospital Tuanku Ja'afar Seremban over a 12-month period between May 2015 and May 2016 (n=164). Socio-demographic profiles, obstetric outcomes, and perinatal outcomes were detailed for each pregnant woman. The results were compared to a control group of 169 pregnant women aged 20–30 who also delivered in hospital Tuanku Ja'afar Seremban during the same period. The aim of this study was to assess the obstetric outcomes of teenage pregnancy and to compare them with those of the control group. A chi-squared test was used to identify the statistical significance of the relationship between teenage pregnancy rates and obstetric outcomes. Results with $p < 0.05$ was considered statistically significant.

Results: The prevalence of teenage pregnancy was 2.8%. The mean age of the teenage group was 17.9; that of the control group was 26.4. Teenage mothers had a significantly higher risk of anemia ($p < 0.05$), episiotomy ($p < 0.001$), preterm labor ($p < 0.001$), and delivering low-birthweight babies ($p < 0.001$). There were no significant differences between the two groups in mode of delivery, antenatal complications, birth outcomes, APGAR scores at 5th minute, or neonatal complications.

Conclusion: The prevalence of teenage pregnancy in this study is relatively low but is associated with an increased risk of some perinatal complications. The primary care physician's role is pivotal in educating adolescents on sexual health, providing continual care in hospitals, and empowering teenagers in their reproductive health decisions.

Introduction

Teenage pregnancy is defined by the World Health Organization as pregnancy that occurs among adolescent girls aged 10–19. Teenage pregnancy is a global social problem related to a wide range of adverse health and social outcomes impacting teenagers, families, and society. Evidence suggests that approximately 14 in every 1,000 underage Malaysian girls, or 18,000 overall, become pregnant each year.^{1,2}

The Malaysia Welfare Department reported that approximately 111 unmarried young girls

were pregnant and that the recorded rate was 6 births per 1000 women aged 15–19 years.³ In 2012, the Ministry of Health recorded 18,847 pregnant girls aged 10–19 at Malaysian public health facilities, which constituted 3.2% of the estimated 580,536 pregnant mothers that year (32 out of 1,000 pregnancies).⁴ Even though the teenage pregnancy rate in Malaysia is fairly low relative to that in many other countries, it may not reflect the actual figure, as illegal abortion and infant abandonment are on the rise among teenage mothers.

The issue of teenage pregnancy remains stark

throughout the rest of the world; the UK still has one of the highest teenage birth rates in Western Europe at 6.4 live births to every 1,000 women aged 15–17 in 2015.^{5–7} The country with the highest rate of adolescent pregnancy is the United States at 57 pregnancies per 1,000 adolescents in 2010, followed by New Zealand at 51 per 1000.⁷

Sixteen million girls between the ages of 15 and 19 are estimated to give birth each year, representing 11% of all global births. Ninety-five percent of these births occur in developing countries and about 89% occur outside of marriage.^{8,9} Gynecologic age (GA), defined as age in years at conception minus age at menarche, serves as an indicator of physiological maturity. Low gynecologic age is associated with an increased chance of obstetric and perinatal complications.¹⁰ Pregnancy-related complications include anemia, bleeding during pregnancy, premature delivery, placental insufficiency, pre-eclampsia, maternal alcohol use, maternal illicit drug use, gestational diabetes, and maternal infection. Delivery complications include emergency cesarean section, preterm birth, prematurity, protracted labor due to underdeveloped pelvis, vacuum extraction/forceps delivery, breech presentation, asphyxia at birth, and nuchal cord entanglement. The perinatal complications include neonatal jaundice and infections in the baby.¹¹ Babies born to mothers under 20 in low-and middle-income countries face a 50% higher risk of being stillborn or dying in the first few weeks than those born to mothers aged 20–29.¹² Although most research links teenage pregnancy with preterm delivery, fetal growth restriction, low birth weight, and fetal or perinatal death, some studies suggest that these outcomes can be prevented with complete coverage and a high quality of maternal care.¹¹ A study on maternal complications in teenagers showed that eclampsia, UTI, stillbirth, and neonatal mortality were more prevalent in cases of inadequate maternal care. In social terms, teenagers receiving inadequate maternal care were often those who were single and did not quit smoking during the first trimester.¹³

Primary care physicians play a key role in engaging with these adolescent patients in confidential, open, and non-threatening discussions of reproductive health and educating them on responsible sexual behavior. Their services must include contraceptive counseling that reinforces appropriate contraceptive practices, such as emergency contraception to

prevent unwanted pregnancies. Through greater understanding of the antecedents of teenage pregnancy, interventions in developing countries may be able to reduce the prevalence of this issue. We aim to use our findings to assist with the development of preventive measures that can be utilized by outreach programs to reduce the burden of teenage pregnancy. We look to integrate our results with university projects on reproductive adolescent health care, which will serve as platforms for disseminating information on sexual well-being.

Objective

To determine the prevalence of teenage pregnancy and compare its obstetric and perinatal outcomes with those of non-teenage pregnancies.

Materials and Methods

Study design

We conducted a retrospective study in the Department of Obstetrics and Gynaecology at Hospital Tuanku Jaafar Seremban by, with permission, obtaining data from Malaysian National Obstetric Registry (NOR) forms. The study received ethical approval from the International Medical University Joint Committee of Ethics and National Medical Research Register (NMRR ID: NMRR-16-845-30277).

National Obstetric Registry

The NOR is a clinical “disease” database that compiles obstetric data to enable healthcare planning, implementation, and evaluation in a defined population. The objective of the NOR is to develop a complete picture of patient care through a comprehensive database that helps track patient management and outcomes.

Sampling method

Between May 2015 and May 2016, a total of 5,800 pregnancies and deliveries of all ages were recorded there. We reviewed all NOR forms recorded during the 12-month period and selected all 164 teenagers (11–19) for participation in our study. The sample size for the study group was calculated using the “sample size for a proportion or descriptive study” calculator from Open Source Statistics for Public Health. Based on this sample size calculation, the number of participants proved to be more than sufficient (n = 136).

To determine obstetric outcomes, we isolated the forms of females aged 20–30 and used simple random sampling to select an additional 168 adults as a control group. Women with high-risk conditions in pregnancy, such as diabetes, heart disease, hypertension, and thyroid disorders, were excluded from the study. The following variables were drawn from the NOR form and categorized into demographic and antenatal backgrounds (maternal age, marital status, social welfare, BMI, parity, type of antenatal care, hemoglobin status); pregnancy outcomes and complications (mode of delivery, type of cesarean section, term or preterm labor, antenatal complications, perineal tears); and perinatal outcomes (birth outcome, birth weight, APGAR score at the 5th minute, neonatal complications).

To protect patient anonymity, we did not include personal information aside from age in our study. Social welfare support is simply whether or not the patient receives welfare support from relevant governmental or non-governmental agencies. BMI is categorized as underweight (<18.5), normal (18.5–24.9), overweight (25.0–29.9), obese I (30.0–34.9), obese II (35.0–39.9), and obese III (>40). Anemia was defined as hemoglobin concentration <11g/dl. For the purpose of this study, stillbirth was defined as any death prior to expulsion from the mother beyond 24-week gestation; infant death was defined as any postnatal fatality during the first year of life. We categorized birthweight as low (LBW) if the birthweight was \leq 2500 gm or normal (NBW) for all other birthweights. Prematurity was defined as any delivery before the 37th week of pregnancy.

Analysis

We analyzed our data using IBM SPSS Statistics v22. We used a chi-squared test to identify the statistical significance of the relationship between teenage pregnancy rates and obstetric outcomes. The 95% confidence intervals were generated and $P < 0.05$ was considered statistically significant.

RESULTS

Sociodemographic profile

Teenage pregnancies were selected from the NOR at Hospital Tuanku Jaafar Seremban. Of the 5,800 deliveries between May 2015 and May 2016, 164 were by teenagers (11–19), meaning there was a teenage pregnancy rate of 2.8%. The mean age of the teenagers was 17.9.

Table 1 shows the demographic and antenatal backgrounds of the teenage and non-teenage pregnancies. There was a significant difference ($p < 0.001$) between the groups in terms of marital status; 39 (23.8%) teenage mothers were unmarried at the time while just 1 (0.6%) non-teenage mother was unmarried. The teenage group had a significantly higher incidence of low BMI ($p < 0.05$) as well as a higher risk of anemia ($p < 0.05$) than the non-teenage group. A large majority (126; 80.3%) of teenagers were nulliparous, though 26 (16.6%) were para 1 and five (3.1%) were para ≥ 2 .

Obstetric complications: Antenatal and intrapartum

Regarding antenatal complications, the incidence of preterm birth is higher in the teenage group (26; 15.9%) than in the non-teenage group (9; 5.4%), and that difference is statistically significant ($p < 0.001$). Regarding medical disorders during pregnancy, about 1.2% of the teenage group had gestational diabetes while eclampsia, severe pre-eclampsia, antepartum hemorrhage, and pre-labor rupture of membrane were present in just 0.6% of teenage pregnancies. Regarding the mode of delivery, 111 teenagers (72.1%) delivered through spontaneous vaginal delivery, 15 (9.7%) through induced labor, 10 (6.5%) through instrumental labor, and 18 (11.7%) through cesarean section. There was no significant difference in the mode of delivery between the 2 groups. It is worth noting that both teenage and non-teenage pregnancies (83.3% and 69.7%, respectively) were more likely to result in an emergency cesarean section than an elective one. This information is displayed in **Table 2**.

Perinatal complications

Fifty-one of the teenagers (31.9%) delivered low-birthweight babies (≤ 2500 g) while just 27 (16.2%) did the same; this difference is statistically significant ($p < 0.001$). No significant differences were detected between the two groups in Apgar score at the 5th minute or neonatal complications. However, there were two intrauterine death (1.2%) in the teenage group but just one (0.6%) in the non-teenage group. A majority of babies in both the teenage group and the non-teenage group (143, 87.2% and 133, 79.2%, respectively) were discharged to their mothers; 8 (4.9%) live births from the adolescent mothers were admitted to NICU. This information is displayed in **Table 3**.

Table 1: Demographic and antenatal backgrounds of the study and control groups

Variable	Teenage group (11–19 years) n=164	Non-teenage group (20–30 years) n=168	p-value
Maternal Age (years), mean (\pm SD)	17.98 (\pm 1.24)	26.42 (\pm 2.63)	
<i>Marital Status, n (%)</i>			
Married	107 (65.2)	165 (98.2)	0.001
Unmarried	39 (23.8)	1 (0.6)	
Divorced	1 (0.6)	0	
Unknown	17 (10.4)	2 (1.2)	
<i>Social Welfare, n (%)</i>			
Yes	5 (3.0)	1 (0.6)	0.43
No	159 (97.0)	167 (99.4)	
<i>BMI, n (%)*</i>			
Underweight	28 (19.2)	14 (8.6)	0.32
Normal	59 (40.4)	52 (31.9)	
Pre-Obese	41 (28.1)	55 (33.7)	
Obese I	16 (11.0)	32 (19.6)	
Obese II	1 (0.7)	7 (4.3)	
Obese III	1 (0.7)	3 (1.8)	
<i>Parity, n (%)*</i>			
0	126 (80.3)	86 (52.8)	0.001
1	26 (16.6)	42 (25.8)	
≥ 2	5 (3.1)	35 (21.4)	
<i>Types of Antenatal Care, n (%)</i>			
Government	148 (90.2)	161 (95.8)	0.27
Private	4 (2.4)	4 (2.4)	
Government and Private	2 (1.2)	2 (1.2)	
Other	3 (1.8)	0	
No Care	7 (4.3)	1 (0.6)	
<i>Booking Hb status, n (%)</i>			
Normal	96 (58.5)	130 (77.4)	0.05
Anemia	47 (28.6)	31 (18.5)	
Missing information	21 (12.8)	7 (4.2)	

Data analyzed with X² test, p-value <0.05 set as significant

* Missing data in BMI and parity because the variables are not filled out in the NOR form

Table 2: Comparison between the outcomes and complications of teenage and non-teenage pregnancies

Variable	Teenage group (11–19 years) n=164	Non-teenage group (20–30 years) n=168	p-value
<i>Preterm labor, n (%)</i>			
Term	138 (84.1)	159 (94.6)	0.001
Preterm	26 (15.9)	9 (5.4)	
<i>Antenatal Complications, n (%)</i>			
Eclampsia	1 (0.6)	0 (0.0)	0.237
Gestational Diabetes	2 (1.2)	8 (4.8)	
Severe Pre-eclampsia	1 (0.6)	1 (0.6)	
Pre-labor Rupture of Membrane	1 (0.6)	0 (0.0)	
Antepartum Hemorrhage	1 (0.6)	0 (0.0)	
Cord Prolapse	0 (0.0)	1 (0.6)	
<i>Mode of Delivery, n (%)</i>			
Spontaneous Vaginal Delivery	111 (72.1)	101 (63.1)	0.05
Induced Labor	15 (9.7)	23 (14.4)	
Instrumental Labor	10 (6.5)	9 (5.6)	
Cesarean section	18 (11.7)	33 (16.9)	
<i>If Cesarean, n (%)</i>			
Elective	3 (16.7)	9 (27.3)	0.312
Emergency	15 (83.3)	24 (72.7)	
<i>Perineal Tears, n (%)</i>			
Intact	39 (23.8)	86 (51.2)	0.001
Tears	31 (18.9)	35 (20.8)	
Episiotomy	94 (57.3)	47 (28.0)	

Data analyzed with X² test, p-value <0.05 set as significant

Table 3: Perinatal outcomes in teenage and non-teenage groups

Variable	Teenage group (11–19 years) n=164	Non-teenage group (20–30 years) n=168	p-value
<i>Birth Outcome, n (%)</i>			
Live Birth	162 (98.8)	167 (99.4)	0.491
Still Birth	2 (1.2)	1 (0.6)	
<i>Low Birth Weight, n (%)</i>			
≤2500g	51 (31.9)	27 (16.2)	0.001
>2500g	109 (68.1)	140 (83.8)	
<i>APGAR Score at 5 min, n (%)</i>			
Good (≥7)	157 (98.1)	163 (99.4)	0.302
Bad (<7)	3 (1.9)	1 (0.6)	
<i>Neonatal Complications</i>			
Asphyxia	2 (22.2)	2 (28.6)	0.481
Transient Tachypnea of Newborn	0 (0)	4 (57.1)	
Prematurity	4 (44.4)	0 (0)	
Other Complications	1 (11.1)	0 (0)	
Intrauterine Death	2 (22.2)	1 (14.3)	
<i>Baby Discharged to, n (%)</i>			
Mother	143 (87.2)	133 (79.2)	0.44
NICU	8 (4.9)	11 (6.5)	
Nursery	11 (6.7)	23 (13.7)	
Mortuary	2 (1.2)	1 (0.6)	

Data analyzed with χ^2 test, p-value <0.05 set as significant

Discussion

The rate of teenage pregnancy in our study was 2.8% and the mean incidence of adolescent pregnancy was 28 births per 1000 women. This is fairly lower relative to the rest of the world—teenage births accounts for 11% of all births worldwide.^{14,15} However, this figure may not reflect the reality of the situation, as there is a rise in Malaysia of illegal abortion and infant abandonment among teenage mothers. The National Registration Department of Malaysia has reported a rising trend of children born out of wedlock, from 8.1% in 2006 to 10.4% in 2010.^{16–18} This is supported by findings from Ruhaizan et al.¹⁹ In contrast, our study found that nearly a quarter of teenagers 23.8% were unmarried compared to just 1 of the adults. These pregnancies could be unplanned with a high reliance on natural contraception despite engaging in premarital sex. Poor education on matters of sexual health may be a contributing factor. A Malaysian analysis found that sex education in local schools was vague and inappropriately taught.²⁰ However, as unmarried teenage pregnancies frequently go unreported, this surprising rate may signify a shift toward a lesser degree of stigma and greater acceptance among parents. Almost none of the mothers from either group in this study were found to have social welfare support. While society is

beginning to show greater acceptance toward teenage pregnancy, Malaysians still hesitate to accept help on this matter, as they may still view it as shameful.²¹

Hemoglobin level was considered because previous studies have shown that anemia is more prevalent among adolescent mothers;²² our findings are consistent with those studies. This association stems from both physiological and social factors. During puberty, large growth spurts and the onset of menstruation deplete the body's iron levels. Furthermore, pregnant adolescents are less likely to be involved in profitable employment due to their low educational status or professional inexperience. Hence, we speculate that they may have limited access to nutritious food or a poor understanding of nutrition. This pairing between insufficient nutritional intake and inadequate iron levels predisposes adolescent mothers to anemia, which increases the risk of preterm labor, low birthweight, and infant mortality, especially during the first two trimesters.^{21,22}

Interestingly, our study found that there was no significant difference in the mode of delivery between the teenage and non-teenage groups, which is congruent with some previous studies. However, this finding contradicts the common belief that, due to physical immaturity, the

underdevelopment of the bony pelvis causes an increased risk of cephalopelvic disproportion in adolescent mothers.²³ One possible explanation is that the large majority of our teenage group was made up of late adolescents who have already reached full bone maturity—female pelvic structures are known to reach adequate maturation within two years after menarche.²³

Consistent with previous research, this study found that babies born of teenage mothers were more likely to have low birthweights (LBW; ≤ 2500 g). While the exact mechanisms that contribute to low birth weight remain unclear, it is one of the most significant drivers of neonatal morbidity. One physiological factor may be the low female biological maturation of teenage women.^{10,23,24} The maturation rate of the blood supply in both the uterus and cervix is not uniform across all women during pubescence. Hence, it may predispose adolescent mothers to a higher risk of subclinical infections, which, in turn, precipitate preterm birth, the proximal cause of LBW in infants.^{23,24} Another explanation may be that restricted blood supply to the uterus and cervix can stimulate prostaglandin production, which ultimately leads to preterm delivery. Additionally, a low level of gonadal hormones in young mothers may predispose them to premature vaginal contraction.²³ Studies have shown that post-menarchal adolescents need at least three years to establish a mature ovulatory cycle. Immaturity of the ovulatory cycle may compromise the secure attachment of a fetus to the uterine wall, resulting in vaginal bleeding and premature contractions.²⁵ Another possible physiological explanation for adolescent mothers being more prone to LBW babies is the competition of nutrients between a growing mother and a developing fetus.²³

Evidence indicates that a lack of prenatal care is a risk factor for preterm delivery.²⁵ Pregnant teens often receive inadequate prenatal care due to immature, negative, or ambivalent feelings surrounding a pregnancy.²⁶ Moreover, teens are often fearful, as they worry about their parents' reactions towards their pregnancies; they may not voluntarily access health care services.^{27,28} This postulation, however, contrasts with our findings. We found that the majority of the teenagers (95.7%) have gone for antenatal checkups in the public, private, or both sectors. Thus, our study suggests that society has become more liberal and tolerant and that teenage mothers now experience less stigmatization and psychological stress; they are able to obtain better support from their

family and community. Additionally, obstetric services in public hospitals are free of charge to all residents. Receiving adequate antenatal care may explain the lower-than-expected rate of adverse maternal and neonatal outcomes. Previous studies have suggested that adolescent pregnancy does not pose a high risk if good prenatal care is provided.^{23,29,30} This is backed up by our findings, as there were no significant differences in the antenatal or perinatal complications between the teenage and non-teenage groups.

Our study also found that the rate of episiotomy was significantly higher in the teenage group. Recent studies suggest that it is more common to have severe injuries involving the anal muscle if the perineum tears spontaneously rather than if an episiotomy is deliberately cut.^{31,32} This is supported by a case-control study of 1,282 teenage-pregnancy deliveries in Turkey, which states that episiotomy is performed to prevent the risk of further perineal tears in primiparous pregnancies.³³ However, a hospital-based retrospective cohort study of 4,101 deliveries in Nepal shows that the risk of delivery by episiotomy was significantly lower ($P < 0.05$) among teenage mothers.³⁴ However, this was due to the gynecologists' reluctance to perform surgical procedures on teenagers.

Outreach programs serve as good platforms to tackle social problems and spread knowledge about teenage pregnancy on a community and individual level. It is commendable that governmental and non-governmental healthcare organizations in Malaysia have made great strides in improving teenage-pregnancy outcomes. However, it is still crucial that pregnant teenagers receive antenatal care as early as possible. Primary care physicians must play a pivotal role in educating the adolescent population; contraceptive practices must be promoted among married adolescents in order to avoid pregnancy until they reach maturity.

Limitations

This study did not include private hospitals, as private-sector data is far less readily accessible. Additionally, most of our data collected from NOR forms is missing certain information—the details on patients' follow-up appointments and previous visits were not available. Thus, we were unable to make certain correlations. For example, we could not examine the association between past medical history and obstetric outcomes. These limitations highlight the fact that the NOR forms must be strengthened in

order to avoid missing data. The national registry is an important database for evaluating the management of obstetric outcomes; its reliability is crucial for developing guidelines that improve care.

Conclusion

Teenage pregnancies are associated with several adverse outcomes, such as increased risks of anemia, episiotomy, preterm labor, and delivering low-birthweight babies. The prevalence of teenage pregnancy is lower in this study than it is in most others. However, this study highlights the fact that a high proportion of pregnant teenagers were unmarried and did not receive social welfare. Sexual education in local schools requires revision; educators must be properly trained in order to enable the dissemination of accurate information. Finally, the social stigma of teenage pregnancy and the shaming that these teenagers face must be addressed.

Funding

No funding sources

Conflicts of interest

The authors report no real or perceived vested interests relating to this article that could be construed as a conflict of interest.

Ethical Approval

The study was approved by the Medical Research and Ethics Committee (MREC). NMRR ID: NMRR-16-845-30277

Acknowledgements

We would like to thank Malaysia's Director General of Health for his permission to publish this article.

References

- Ermisch J. Does a 'teen-birth' have longer-term impacts on the mother? Suggestive evidence from the British household panel survey. Institute for Social and Economic Research; 2003.
- Said S. Exploring the causes of teenage pregnancy in M'sia. *Bernama*. 3rd January 2019. Available from: [Accessed].
- Noordin N, Zakaria Z, Sawal MZHM, Hussin ZH, Ngah K, Nordin J. The voice of youngsters on baby dumping issues in Malaysia. *Global Journal of Health Science* 2013;3(1): 66–71.
- Ministry of Health Malaysia. Annual Report 2012. [internet] [cited 1st November 2015]. Available from: <http://www.moh.gov.my/images/gallery/publications/MOH%202012.pdf>.
- Berrington A, Diamond I, Ingham R, et al. Consequences of teenage parenthood: pathways which minimise the long-term negative impacts of teenage childbearing. Southampton: University of Southampton; 2005. Final report.
- UNICEF. Child poverty and perspective: an overview of child wellbeing in rich countries. New York: UNICEF; 2007.
- Office for National Statistics. Conception statistics in England and Wales. 2007.
- Sedgh G, Finer LB, Bankole A, et al. Adolescent pregnancy, birth, and abortion rates across countries: levels and recent trends. *Journal of Adolescent Health*. 2015;56(2): 223–230.
- Braine T. Adolescent pregnancy: a culturally complex issue. *Bulletin of the World Health Organization*. 2009;87(6): 410–411.
- Hamilton, BE, Martin, JA, Osterman, MJK, Curtin, SC. Births: final data for 2014. Hyattsville, MD: National Center for Health Statistics; 2014.
- Suan MAM, Ismail AH, Ghazali H. A review of teenage pregnancy research in Malaysia. *Medical Journal of Malaysia*. 2015;70(4): 214–219.
- Kaplanoglu M, Bülbüla M, Koncab C, et al. Gynecologic age is an important risk factor for obstetric and perinatal outcomes in adolescent pregnancies. *Women and Birth*. 2015;28(3): 1–5.
- Lukkari S, Hakko H, Herva A, Pouta A, Riala K, Räsänen P. Exposure to obstetric complications in relation to subsequent psychiatric disorders of adolescent inpatients: specific focus on gender differences. *Psychopathology*. 2012;45(5): 317–326.
- World Health Organization. Adolescent Pregnancy Fact Sheet. [internet] Switzerland: WHO; 2014 [cited 1st November 2015]. Available from: http://apps.who.int/iris/bitstream/10665/112320/1/WHO_RHR_14.08_eng.pdf.
- Leppälähti S, Gissler M, Mentula M, Heikinheimo O. Is teenage pregnancy an obstetric risk in a welfare society? A population-based study in Finland, from 2006 to 2011. *BMJ Open*. 2013;3(8): e003225.
- Noordin N, Zakaria Z, Sawal MZHM, Hussin ZH, Ngah K, Nordin J. The voice of youngsters on baby dumping issues in Malaysia. *Global Journal of Health Science*. 2013;3(1): 66–71
- Ministry of Health Malaysia. Annual Report 2012. [internet] [cited 1st November 2015]. Available from: <http://www.moh.gov.my/images/gallery/publications/MOH%202012.pdf>.

18. Augustin S. Malaysia: birth out of wedlock 'alarming'. *New Straits Times*. 21st March 2011. Available from: LINK [Accessed DATE].
19. Ruhaizan H, Ravichandran J, Rozima S, et al. Unwed mothers from 14 tertiary hospitals in Malaysia 2011–2012. In: *7th National Conference for Clinical Research, 3–5 September 2013*. Kuala Lumpur; 2013.
20. Talib J, Mamat M, Ibrahim M, Mohamad Z. Analysis on sex education in schools across Malaysia. *Procedia - Social and Behavioral Sciences*. 2012;59: 340–348.
21. Saim NJ. Social support, coping, resilience and mental health in Malaysian unwed young pregnant women and young mothers: their experiences while living in a shelter home [dissertation]. Umeå: Umeå Universitet; 2013 [Accessed 26th July 2016]. Available from: <http://umu.diva-portal.org/smash/record.jsf?pid=diva2%3A662379&dsid=-3159>.
22. Banerjee B, Pandey GK, Dutt D, Sengupta B, et al. Teenage pregnancy: a socially inflicted health hazard. *Indian Journal of Community Medicine*. 2009;34(3): 227–231.
23. Brabin BJ, Hakimi M, Pelletier D. An analysis of anemia and pregnancy-related maternal mortality. *Journal of Nutrition*. 2001;131(2): 604S–615S.
24. Zimmermann MB, Hurrell RF. Nutritional iron deficiency. *The Lancet*. 2007;370: 511–520.
25. Thaitae S, Thato R. Obstetric and perinatal outcomes of teenage pregnancies in Thailand. *Journal of Pediatric and Adolescent Gynecology*. 2011;24(6): 342–346.
26. Roth J, Hendrickson J, Schilling M, Stowell DW. The risk of teen mothers having low birth weight babies: implications of recent medical research for school health personnel. *Journal of School Health*. 1998;68(7): 271–275.
27. Khashan AS, Baker PN, Kenny LC. Preterm birth and reduced birthweight in first and second teenage pregnancies: a register-based cohort study. *BMC Pregnancy and Childbirth*. 2010.
28. Centers for Disease Control and Prevention. *Preterm Birth*. Available from: <http://www.cdc.gov/reproductivehealth/maternalinfanthealth/pretermbirth.htm> [Accessed DATE].
29. Xi-Kuan Chen, Shi Wu Wen, Nathalie Fleming, et al. Teenage pregnancy and adverse birth outcomes: a large population based retrospective cohort study. 2007;36: 368–373.
30. Debiec KE, Paul KJ, Mitchell CM, et al. Inadequate prenatal care and risk of preterm delivery among adolescents: a retrospective study over 10 years. 2010;203(2): 122.
31. Sulaiman S, Othman S, Razali N, Hassan J. Obstetric and perinatal outcome in teenage pregnancies. *South African Journal of Obstetrics and Gynaecology*. 2013;19(3): 77–80.
32. NHS. *Episiotomy and Perineal Tears*. Available from: <http://www.nhs.uk/conditions/pregnancy-and-baby/pages/episiotomy.aspx> [Accessed DATE].
33. Demirci O, Ertuğrul Y, Özgür T, et al. Effect of young maternal age on obstetric and perinatal outcomes: results from the tertiary center in Turkey. 2016;33(3): 344–349.
34. Yadav S, Choudhary D, Narayan KC, et al. Adverse reproductive outcomes associated with teenage pregnancy. 2008;11(2): 141–144.