

## Age-dependent Birth Outcomes for Mothers at The Shiphrah Birthing Home in Rizal, Philippines

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### Abstract

*Young maternal age ( $\leq 19$  years) at childbirth in low- to middle-income countries is associated with adverse birth outcomes for both mother and child, including increased risk for infant mortality and later adverse childhood outcomes. Current laws in the Philippines mandate adolescent mothers to give birth in a facility equipped with an operating room; however, there is little evidence to support this as the best practice for the needs of adolescent mothers. The purpose of this cross-sectional study was to compare pregnancy and birth data for adolescent versus adult mothers to discover associations between maternal age and birth outcomes. Data were selected from birth records spanning 1991-2018 ( $n=253$ , age 16-39). Results suggest young maternal age had a positive correlation with gestational age at birth but a direct negative correlation to birth weight. Birth weight reached a maximum for mothers aged 20-35 but decreased at ages above or below this group. Results align with other studies of similar design in LMIC. The potential influence of socioeconomic determinants as a potential confounding factor is discussed. Comprehensive birth centers may provide better access to prenatal nutrition and health education than hospital facilities and may improve adolescent maternal health.*

*Keywords: Maternal and infant health, adolescent pregnancy, Philippines.*

### Introduction

Young maternal age ( $\leq 19$  years) is closely associated with adverse birth outcomes such as preterm birth ( $\leq 37$  weeks of gestational age), low birth weight (LBW;  $< 2500$ g) (Chantrapanichkul and Chawanpaiboon 2013, Kozuki *et al.*, 2013, Fall *et al.*, 2015, Torvie *et al.*, 2015). Preterm birth is the leading cause of newborn morbidity and mortality globally (WHO 2). Furthermore, prematurity and LBW are associated with adverse childhood outcomes, including long-term negative impact on nutritional status and schooling (de Vienne *et al.*, 2009, Jutte *et al.*, 2010, Gibbs *et al.*, 2012, Fall *et al.*, 2015). Adolescent mothers face unique biological and social disadvantages that older mothers do not. If still growing herself, the adolescent mother will compete with the fetus for nutrition during pregnancy, increasing risk for fetal and maternal undernutrition and anemia (Scholl and Hediger 1993, Omar *et al.*, 2010). Adolescent mothers are more likely than older mothers to breastfeed for a shorter period of time and to have less education, lower socioeconomic status, and decreased familial or partner support, leaving them poorly equipped for the adult roles they must take on prematurely (Wambach and Cohen 2009, Omar *et al.*, 2010, Restrepo-Méndez *et al.*, 2014, Al-Kloub *et al.*, 2019).

Adolescent pregnancy has been identified as a major public health challenge in low- to middle-income countries (LMIC) in the South-East Asia region (WHO 1). Ninety-five percent of adolescent pregnancies worldwide occur in LMIC, where LBW and small-for-gestational-age (SGA) births are a prevalent health burden (WHO 1, Lee *et al.*, 2013). The incidence of adolescent pregnancy has been steadily increasing in the Philippines over the past three decades, notably for urban areas with higher levels of education and socioeconomic status (Natividad 2013). In 2017, the adolescent fertility rate in the Philippines was 60 (number of live births per 1000 women ages 15-19 per year), significantly exceeding the average of 48 per 1000 for the LMIC index (World Bank). Despite high adolescent fertility in LMIC, the most extensive research on associations between birth outcomes and young maternal age tends to focus on populations in high-income countries, where the average adolescent fertility rate is much lower at 16 per 1000 (World Bank, Malabarey *et al.*, 2012). Early research in LMIC indicated significantly lower incidence of LBW for adolescent pregnancies that received extensive prenatal care from certified nurse midwives (Piechnik and Corbett 1985). Later research demonstrated adverse birth outcomes in general for adolescent mothers, especially those who had

negative relationships with midwives administering prenatal care (Miller 1993, Chaibva *et al.*, 2010). These findings may have played a part in the formation of standard clinical practice for the care of adolescent mothers. In 2016, the Philippines' Department of Health classified adolescent pregnancies as high-risk, prohibiting all mothers under age 20 from giving birth in a facility not equipped with an operating room, including many midwifery clinics (Gunderson, Personal Communication). Though this law still permits adolescent mothers to seek and receive prenatal and postpartum care at such birth centers, the elimination of these birth centers as an option for delivery may have negative consequences for maternal and birth outcomes, such as increased rates of obstetric interventions that are associated with birth complications (Gottvall *et al.*, 2011). Insufficient data on adolescent reproductive health has been collected in the Philippines or other LMIC to suggest that this law will best address this population's needs (Gray *et al.*, 2013).

For adolescent mothers in the Philippines, birth centers and midwifery clinics may actually present a better delivery option than hospitals. Low-risk mothers who delivered at birth centers were found to have reduced rates of cesarean sections and vacuum extractions and reduced diagnoses of fetal distress compared to deliveries in hospitals (Gottvall *et al.*, 2011). This may be due to the instrumental role of midwives in creating safe environments at birth clinics that promote the care of vulnerable mothers. Midwives' partnership with community-level health workers was found to be fundamental to the success of health outreach initiatives to vulnerable mothers (Salmon and Maeda 2014). If midwifery clinics are provided with ample social, economic, and professional support, vulnerable mothers could receive high-quality care throughout pregnancy regardless of socioeconomic status (Salmon and Maeda 2014, Filby *et al.*, 2016, Joseph *et al.*, 2016). One such midwifery clinic is the Shiphrah Bahay Paanakan (Shiphrah Birthing Home) in Taytay, Rizal, Philippines. Founded in 1986 by Jeri Gunderson, Shiphrah Birthing Home is staffed by professional midwives certified in the Philippines who provide 9-week prenatal educational seminars and birth services to the local community at no charge (Shiphrah). The mission of this clinic is to provide dignified high-quality care by fostering a welcoming environment and a community of trust between mothers and midwives. This comparative cross-sectional study seeks to compare birth outcome data between adolescent and adult mothers who received prenatal checkups and gave birth at a birthing home to gain a deeper understanding of the needs of adolescent mothers in Rizal and how a midwifery clinic like Shiphrah can address them.

## **Methods**

This was a retrospective cross-sectional study of women who received prenatal and postpartum care from and gave birth at the Shiphrah Birthing Home in Taytay, Rizal, Philippines. Data was selected from 253 individual prenatal, labor, birth, and postpartum records spanning 1991-2018. All data were for singleton, in-clinic live births to women from the Rizal province over the aforementioned time period. To examine maternal outcomes, data were collected for each patient's age, net weight change over pregnancy, and vaginal laceration degree after birth. Lab results were also recorded for most admissions after 1999, including Hb and Hct levels. To examine infant outcomes, data was collected for each infant's gestational age, Apgar score, and anthropometric measurements including birth weight, length, head circumference, and chest circumference.

Appropriate statistical analyses were conducted using JMP (SAS) Version 14 software to determine relationships between factors of birth outcome and maternal age. A one-way between subjects' ANOVA was conducted to examine the relationship between maternal age and gestational age. Associations were also examined between maternal age, birth weight, gestational age, laceration degree, gravida (number of times a woman has been pregnant), and Apgar score (numerical score between 0 and 10 used to assess newborn health) (Gravidity, APGAR).

## **Results**

### **Maternal and Infant Characteristics**

Mean age of mothers was  $22.83 \pm 5.63$  years (mean  $\pm$  SD), ranging from ages 16 to 39. Mean maternal weight change over the course of pregnancy was a gain of  $6.97 \pm 6.1$  kg. Mean gestational age for infants was  $39.15 \pm 1.49$  weeks, and mean birth weight was  $2898.69 \pm 414.41$  g. Mothers were divided into four age categories:  $\leq 19$  years, 20-29 years, 30-34 years, and  $\geq 35$  years. Mean gestational age, mean birth weight, and percentage of LBW infants were calculated for each category as shown in Table 1.

### Maternal Health Outcomes and Birth Outcomes

There was a negative linear relationship discovered between maternal age and gestational age, with young mothers having significantly longer gestation periods than older mothers ( $F=6.4$ ,  $df=1$ ,  $p=0.01$ ) (Fig. 1, Table 1). A positive linear relationship was discovered between maternal age and birth weight ( $F=21.1$ ,  $df=1$ ,  $p<0.001$ ) (Fig. 2). Mean age for mothers of LBW infants was  $21.29 \pm 0.88$  years, slightly lower than the mean age for mothers of normal weight infants at  $23.32 \pm 0.41$  years ( $F=4.45$ ,  $df=1$ ,  $p=0.036$ ). Lower gravida was associated with increased occurrence of 2nd degree vaginal lacerations ( $F=11.3$ ,  $df=2$ ,  $p<0.001$ ). Primigravida mothers, regardless of maternal age, had the highest incidence of laceration (Do I need to demonstrate how I found this?). There was no difference in Apgar score as a function of maternal age, with an even spread of Apgar scores from 8 to 10 for all newborns ( $F=2.04$ ,  $df=5$ ,  $p=0.07$ ).

### Discussion

Overall, this study found that infants of adolescent mothers had comparable birth outcomes to those of adult mothers with regard to Apgar score, anthropometric measures, and gestational age. Adolescent mothers also had comparable maternal health outcomes to their adult counterparts. Vaginal laceration was attributable to lower gravida rather than maternal age. Younger mothers also had significantly longer gestation periods than older mothers, a factor typically associated with more mature babies (WHO 3). Despite having longer gestation periods, however, infants of adolescent mothers had significantly lower birth weights than infants of older mothers, which is to be expected as demonstrated by other studies (Bakker *et al.*, 2011, Restrepo-Méndez *et al.*, 2015).

These findings were consistent with other maternal and infant health comparison studies, which demonstrated that mothers under age 20 and over age 34 had higher odds of LBW (Restrepo-Méndez *et al.*, 2015). However, socioeconomic factors other than young maternal age are demonstrated to be the greatest contributor to excess risk of LBW (Restrepo-Méndez *et al.*, 2015). Socioeconomic factors were not measured in this study, but it was noted that the majority of mothers refused basic newborn screening due to financial constraints. Furthermore, no fees for prenatal care or in-clinic births were charged to any patients, allowing families in the nearby urban squatter community to access prenatal, birth, and postpartum services at Shiphrah Birthing Home. Factors such as income level, food security, and nutritional status were not measured in this study but may have contributed greatly to newborn health.

Limitations to this study include small sample size and small sample region. Little data was available for adolescent mothers under 16 years of age, so it is difficult to generalize the results to younger adolescent mothers, a population with arguably more critical health needs than older adolescent mothers due to their own competing needs for nutrition and development. Despite such limitations, similar studies indicate that maternal health and birth outcomes can be reliably estimated from parameters of gestational age, birth weight, and other infant anthropometric measures (WHO 1). Birth weight and size at birth are important indicators of fetal and neonatal health, and these factors can be used in combination with gestational age to determine intrauterine growth or predict newborn growth (WHO 3).

Various maternal and child health initiatives in LMIC in the past have focused only on the promotion of infant health, often ignoring mothers' health needs and resulting in high rates of maternal mortality (Rosenfield and Maine 1985). In the 1987 Safe Motherhood Initiative, global health leaders and women's rights advocates sought to collaboratively to promote maternal health as a public health priority. However, implementation of the initiative yielded limited levels of success (Starrs 2006). Other efforts such as the Philippines' Millennium Development Goals (MDGs) in 2000 sought to reduce their high maternal mortality rates from 172 deaths per 100,000 in 1998 to 52 deaths per 100,000 by 2015 (World Bank). Unfortunately, these MDGs were not met, and the maternal mortality ratio in 2015 was 114 per 100,000 (Starrs 2006). Clearly, promoting maternal health is no easy or simple task that can be accomplished quickly. Long-term programs making efforts toward implementing evidence-based clinical practice for vulnerable women must take into account a broader history of social structures and economic factors in order to dismantle barriers to women's medical care (Laopaiboon *et al.*, 2008, Barnet 2012). In the Philippines, birth centers are facing increasing legal restrictions that threaten to inhibit delivery of care because of a perceived deficiency of regulation compared to large hospitals (Gunderson, Personal Communication). However, these birth centers may be better equipped than

larger hospitals to facilitate the attentive care vulnerable mothers require, since they already play a dominant role in administering postpartum health care services to mothers and can offer the essential comprehensive prenatal care that can diminish complications in pregnancies (Scholl *et al.*, 1994, Gottvall *et al.*, 2011, Yamashita *et al.*, 2014).

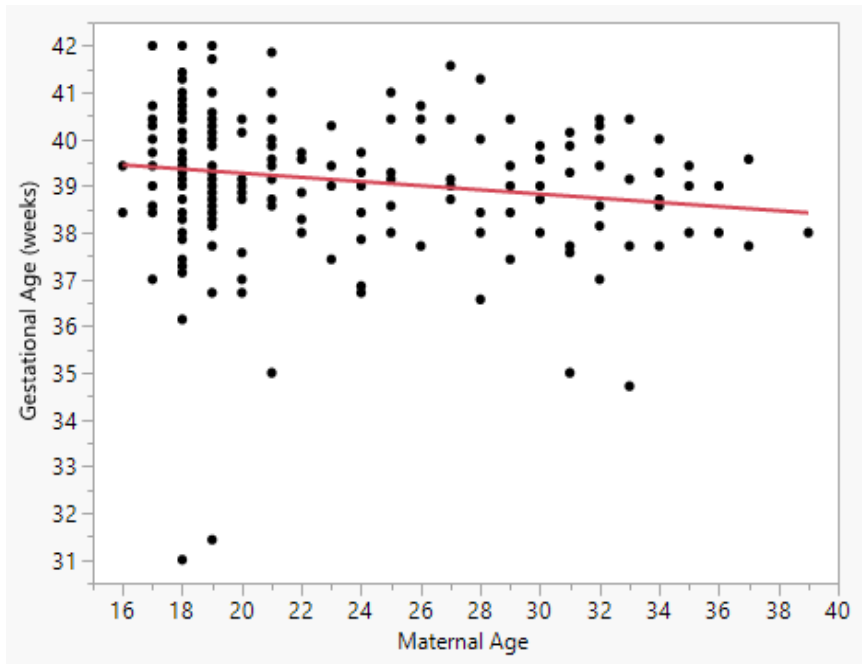
In conclusion, the results of this study support previous research demonstrating that healthy adolescent mothers with adequate prenatal care and birth services can have comparable birth outcomes to adult mothers at birth centers under the care of trained midwives (Gottvall *et al.*, 2011). If prenatal care is well-monitored at a birth center and mothers maintain a healthy pregnancy, young maternal age may not warrant a high-risk pregnancy necessitating emergency obstetric intervention at a hospital. Future in-depth studies are recommended in order to adjust for variables of socioeconomic status, which may be a greater determinant of adolescent maternal health than young age. Midwifery clinics that provide extensive prenatal care services and health education such as Shiphrah Birthing Home may promote adolescent maternal and infant health outcomes.

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## Appendix

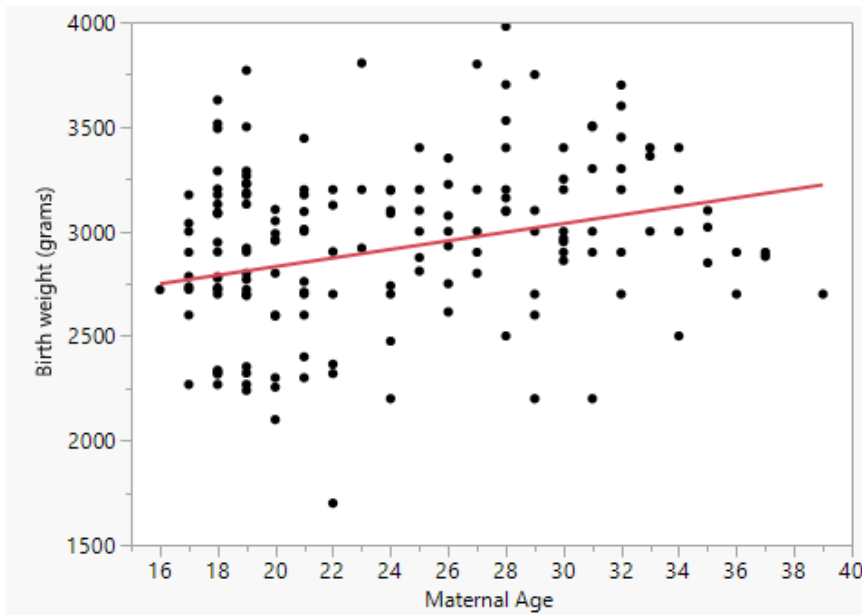
**Figure 1:** Gestational Age Decreases with Maternal Age.



$$\text{Gestational Age (weeks)} = 40.162714 - 0.0445657 \times \text{Maternal Age}$$

RSquare = 0.02865

**Figure 2:** Birth Weight Increases with Maternal Age.



$$\text{Birth weight (grams)} = 2419.9795 + 20.57426 \times \text{Maternal Age}$$

RSquare = 0.086143

**Table 1:** Newborn Characteristics by Maternal Age Group.

<b>Maternal Age Group</b>	<b>Total N</b>	<b>% LBW (&lt;2.5kg)</b>	<b>Mean Gestational Age (wks)</b>	<b>Mean Birth Weight (kg)</b>
≤19	110	24.55	39.39 ± 1.50	2.793 ± 0.262
20-29	83	25.78	39.09 ± 1.26	2.952 ± 0.227
30-34	34	2.94	38.65 ± 1.45	3.108 ± 0.679`
≥35	8	0	38.59 ± 0.74	2.881 ± 0.170

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