




To What Extent Do Ecological Factors of Behavior Contribute to the Compliance of the Antenatal Care Program in Dumai City, Indonesia?

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Purpose: Maternal mortality rate (MMR) in Indonesia is still relatively high, at 305 per 100.000 live births (2015). Routine visit to antenatal care is the best way to reduce MMR. In spite of this, the number of antenatal care visits among pregnant women is still low. This study aimed to measure the influence of behavioral ecological factors with the compliance of pregnant women to visit antenatal care.

Patients and Methods: Study population was pregnant women living in Dumai City, Indonesia. This study was a quantitative research design with a cross-sectional. We used the cluster system to select participants. A total of 369 subjects participated with a gestation age between >12 until 40 weeks. The data were collected by face-to-face interviews using validated questioners. The analysis was done by bivariate analysis using the Spearman correlation test. Multivariate using multiple linear regression.

Results: This study showed that factors of the ecological model of behavior were related to antenatal care compliance (p value<0.05) with a coefficient correlation (0.330–0.569). Multivariate analysis showed that all variables associated significantly (adjusted R^2 ; 0.104–0.311). Five variables were dominant; knowledge, cultural beliefs, family support, friend support, and health facilities with adjusted $R^2=0.518$.

Conclusion: Five factors in an ecological model of behavior, such as knowledge, cultural beliefs, family support, friend support, and health facilities, proportion (51,8%) of contributing to antenatal care compliance. We recommend a health district program to make services more accessible to pregnant women. Health education programs need to increase the knowledge of pregnant women and families to provide support in antenatal care compliance. Local governments shall improve antenatal care quality by mapping, planning, and evaluating this program.

Keywords: pregnant women, behavior, knowledge, culture, family support, health facilities

Introduction

The third target on the first point in the Sustainable Development Goals states that the framework of sustainable development is to promote healthy living and promote prosperity for all. To achieve this, the maternal mortality rate must be <70/100.000 by 2030.¹ In 2015, MMR in the world was 216/00,000, still not on the target (102/100.000), while MMR in Indonesia was still 305/100.000 live births.^{2,3}

Several programs, such as “the safe motherhood program” (1990), the “Gerakan Sayang Ibu” (movement to support mother), “the Making Pregnancy Safer strategy” (2000), and “The Expanding Maternal and Neonatal Survival” program (2012) have been launching. However, the MMR remains high.

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The effort to reduce MMR should be a concern about antenatal care (ANC) and maternal education.⁴ Therefore, the provision of Antenatal care services can detect complications and the high risk of pregnancy⁵. Antenatal care compliance is the behavior of pregnant women to visit health care facilities for the identification of high-risk pregnancies.

Globally, a four-time visit to Antenatal care prove to be able to reduce MMR.^{6–8} Meanwhile, in developing countries, only 31% of pregnant women receive services from trained health workers.⁹ Therefore, in low-income and developing countries, antenatal care visits must be increased.^{10,11}

The government of Indonesia stated 95% coverage of antenatal care visits as a program's standard. There was a decrease in antenatal care visits from during the period 2012–2016, from approximately 90.1% decline to 85.3%. One of the lowest of the Antenatal care visit was Riau province (76.1%). We conducted this study in Dumai city, which has the minimum coverage in Riau province (71.5%).²

Several studies have also examined the compliance of antenatal care. There are many factors causing compliance, such as characteristics, behavior, poor service quality, including facilities, human resources competencies, socio-economic, and socio-cultural.^{12,13} Based on Green theory, individual behavior is affected by three domains; knowledge, attitude, and practices.¹⁴

If we want to reduce maternal mortality rate, antenatal care compliance among mothers should be improved. Many factors affect the compliance of Antenatal care. The element of the ecological is intrapersonal factors (characteristics, attitudes, knowledge, beliefs), interpersonal factors (family support, friends and community leaders support), institutional factors (health facilities), community factors (media, and public policy).¹⁵ Unfortunately, there is no evidence regarding the involvement of behavioral ecological factors toward antenatal care visit compliance of pregnant women. This study aims to measure the components of the ecological model of behavior change as recommendations for improving antenatal care programs.

Materials and Methods

Study Design

Quantitative research with cross-sectional design. The framework theory of an ecological model of behavior was applied to describe antenatal care compliance embracing social circumstances.

Study Site

We conducted the study during the fourth month in 2019 (February-June), in Dumai City, Riau Province, Indonesia. We did our research in all of seven sub districts namely; West Dumai, East Dumai, Bukit Kapur, Sungai Sembilan, Medang Kampai, and South Dumai. These sub district were the lowest antenatal care visit coverage in Riau Province.

Study Subject

The total of pregnant women in Dumai City was 11.499. Considering that the ANC examination program starts in the first trimester, we applied a gestational age of more than 12 weeks as an inclusion criterion and obtained a number of 9.057 pregnant women as study population. Samples size was 369 based on calculations using proportional stratified random sampling and distributed based on proportion to the sub district area. Sample distribution were: West Dumai (42 subjects), East Dumai (84 subjects), Bukit Kapur (48 subjects), Sungai Sembilan (43 subjects), Medang Kampai (19 subjects), Dumai center (51 subjects), and South Dumai (82 subjects).

We selected respondents using simple random sampling and visit them base on the address. Three respondents did not complete the questionnaire (drop out), and two women were not willing to be respondents, then we selected and replaced the same procedure. Selection of the participants as seen in [Figure 1](#)

Ethical Consideration

The Ethics Committee for Health Research, Faculty of Public Health, Diponegoro University, issued ethical clearance for this study (No.240/EA/KEPK-FKM/2018). Each participant signed written informed consent.

Variables

The variables in this study consisted of the characteristics of respondents, namely: age, education, occupation, pregnancy trimester, and parity. The independent variable consists of: attitudes, knowledge, cultural beliefs, husband support, family support, friend support, community leaders support, health facilities, media, and public policy. The dependent variable is antenatal care compliance.

The definition of attitude in this study is how pregnant women think about their behavior during pregnancy and antenatal care visits. For example: consuming Fe tablets, tetanus injections, time of prenatal care visits, attitudes to pregnancy risk. The question of knowledge told about what

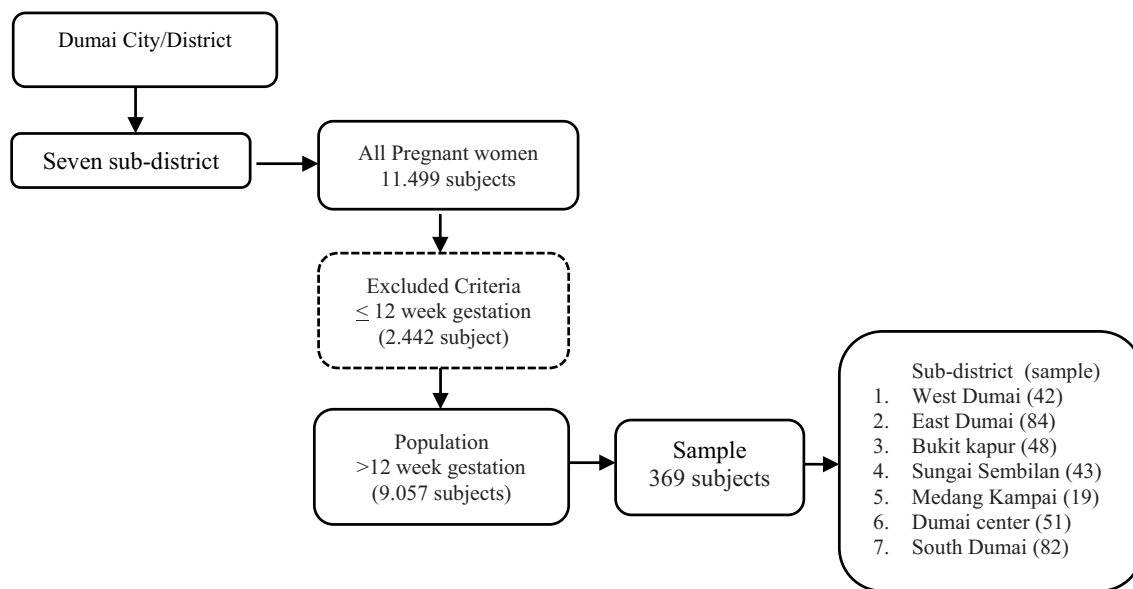


Figure 1 Selection of the participants.

is the opinion of pregnant women about knowledge during pregnancy. The time of prenatal care visit, early detection of risk factors, weight gain during pregnancy, the function of calcium tablets, and counseling about the birthing process.

The question of cultural beliefs told about myth during pregnancy, food consumption, check pregnant to a shaman, and risky. The question of husband, family, friend, community leaders support talked about financial, transportation, mentality support, and pregnancy advice. The issue of health facilities, health workers, describes service in a health facility, health workers competencies and, health insurance. The question of media explained to get health information via television, social media, newspaper, magazine. The question of public policy about labor fees, health insurance, and free health facility policies. The Independent variable is antenatal care compliance, to found their experience, activities, reasons, and desires to carry out pregnancy check-ups visit, join in pregnant women class, check pregnant on schedule or not.

Data Collection

Data were collected using a structured questionnaire. The validity and reliability of the questionnaire are carried out in a sub-district that has characteristics equivalent to the study group (Rumbai sub-district). There were 30 respondents participated. The test is carried out twice until the questionnaire valid and reliable was declared. For validity test: comparer $r^{(table)} (0,36) > r^{(counts)}$ and the reliability test used Cronbach alpha > 0.6 . Totally 63 questions were valid and reliable.

The questionnaire of ten independent variables consisted of attitude (8 points), knowledge (11 points), cultural beliefs (5 points), support from husband, family, friend, community leaders (totally 15 points), health facilities (7 points), media (4 points), public policy (5 points). The dependent variable is antenatal care compliance (8 questions). Independent and dependent variable collected data used discrete numeric with an interval scale (disagree-1-2-3-4-5-6-7-8-9-strongly agree).

We selected ten midwives as enumerators. We did a three-day training to standardize the skill of enumerators and distributed them in seven sub-districts. For larger areas, such as West Dumai, South Dumai, and Bukit Kapur, were placed, two enumerators. The questionnaire was collected by face-to-face interviews. On average, the enumerators spent 45 minutes to interview and fulfill the questioners. Each enumerator interviewed, on average, 3–5 participants per day and sent it to the supervisor on the same day.

Data Analysis

The researcher checked and coded the completed questionnaires. A Research member will input the data to the computer. Collected data were entered twice and double-checked to minimize errors. Data were analyzed using a computer program. We calculated frequencies, percentages, mean, median, and Standard Deviation.

The Bivariate analysis used the Spearman rank coefficient correlation; p -value < 0.05 was considered statistically significant. Spearman rank coefficient measures the degree of

association between the behavior of pregnant women according to the ecological approach to antenatal care compliance.¹⁶ Multivariate analysis using multiple linear regression. We also conducted normality tests, multicollinearity, autocorrelation, and linearity tests for data validity.

Results

Study Characteristics

Characteristics of pregnant women in this study include age, education, occupation, gestational age, and parity. Distribution of respondent characteristics in pregnant women (Table 1).

Table 1 presents the dominant group of age was <35 years (84,8%). Prominent characteristics were low education (elementary and junior high school), 69.9%. The majority of pregnant women are unemployment (82,4%), and they were multigravida (69,9%).

The cause of antenatal care compliance consists of many factors. In this bivariate analysis, we will explain the correlation coefficient between the independent variables to ANC compliance, and we used the Spearman coefficient correlation (Table 2).

Table 2 shows that all variables were significantly correlated (p -value <0,05). Six variables have moderately

correlated associated (>0.25–0.50); there are attitudes, cultural beliefs, husbands support, community leaders, media, and public policy. Four variables were strongly correlated (>0.50–0.75); knowledge, family support, friend support, and health facilities.

Multivariate data analysis used multiple linear regression with the backward method.¹⁷ There are two stages carried out in this analysis, namely partial (sub-structure I) and combination (sub-structure II) (Table 3).

Table 3 shows that all independent variables of the ecological model of behavior have a significant correlation (p -value<0,05). The partial analysis (sub-structure I), found that all independent variables contributed to antenatal care compliance in this region. All independent variables (X) are regressed with the dependent variable (Y). The elimination of variable X was based on the smallest F-value (^{partial}) and whether or not the variable X in the model was also based on F-value (^{table}).

They have six models until the value of each variable did not have p -value >0,05. Finally, the combined analysis (sub-structure II) has five independent variables that contributed to the antenatal care compliance proportion by 51.8% (adjusted $R^2=0.518$). There are knowledge, cultural beliefs, family support, friend support, and health facilities.

Table 1 Characteristics of Pregnant Women Over 12 Weeks in Dumai City, Indonesia. 2019

| Characteristics | n=369 | % |
|----------------------------|-------|------|
| Mothers age (years) | | |
| 17–20 | 24 | 6,5 |
| 21–35 | 289 | 78,3 |
| 36–48 | 56 | 15,2 |
| Education | | |
| Elementary school | 62 | 16,8 |
| Junior high school | 196 | 53,1 |
| Senior high school | 83 | 22,5 |
| Diploma | 10 | 2,7 |
| Bachelors degree | 18 | 4,9 |
| Occupation | | |
| unemployed | 304 | 82.4 |
| employed | 65 | 17.6 |
| Pregnancy trimester | | |
| Third | 180 | 48.8 |
| Second | 189 | 51.2 |
| Gravidity* | | |
| Multigravida | 258 | 69.9 |
| Primigravida | 111 | 30.1 |

Notes: *Gravidity is the number of times a mother gets pregnant. Multigravida, if pregnant for more than one time. Primigravida, if pregnant for the first time.

Discussion

ANC Compliance

This study showed that five factors contributed to antenatal care compliance, such as knowledge, cultural beliefs, family support, friend support, and health facilities. Many health

Table 2 Spearman Coefficient Correlation an Ecological Model of Behavior to Antenatal Care Compliance in Dumai City, Indonesia, 2019

| Variable | Mean | Median | SD | Coefficient Correlation | p-value (< 0.05) |
|---------------------------|------|--------|------|-------------------------|------------------|
| Attitude | 5.66 | 6 | 1.33 | 0.374 | 0.000 |
| Knowledge | 6.22 | 6 | 1.34 | 0.553 | 0.000 |
| Cultural beliefs | 5.93 | 6 | 1.75 | 0.330 | 0.033 |
| Husband support | 7.43 | 8 | 1.41 | 0.383 | 0.000 |
| Family support | 6.44 | 7 | 1.86 | 0.557 | 0.000 |
| Friend support | 5.52 | 5 | 1.81 | 0.508 | 0.000 |
| Community leaders support | 4.84 | 5 | 1.99 | 0.410 | 0.000 |
| Health facilities | 6.96 | 7 | 1.43 | 0.569 | 0.000 |
| Media | 5.66 | 6 | 1.99 | 0.440 | 0.000 |
| Public policy | 6.50 | 7 | 1.61 | 0.429 | 0.000 |

Abbreviations: SD, standard deviation.

Table 3 Summary of Multivariate Analysis

| Variable | Unstandardized Coefficient B | Beta Coefficient | t | p-value <0.05 | r | R ² |
|-----------------------------------|------------------------------|------------------|--------------|---------------|----------------|-------------------------|
| Partial (Substructure I) | | | | | | |
| Attitude | 0.439 | 0.387 | 8.030 | 0.000 | 0.387 | 0.149 |
| Knowledge | 0.626 | 0.558 | 12.870 | 0.000 | 0.558 | 0.311 |
| Cultural beliefs | 0.278 | 0.323 | 6.536 | 0.000 | 0.323 | 0.104 |
| Husband support | 0.410 | 0.385 | 8.000 | 0.000 | 0.383 | 0.149 |
| Family support | 0.436 | 0.538 | 12.221 | 0.000 | 0.538 | 0.289 |
| Friend support | 0.426 | 0.511 | 11.393 | 0.000 | 0.511 | 0.261 |
| Community leaders support | 0.314 | 0.414 | 8.717 | 0.000 | 0.411 | 0.172 |
| Health facilities | 0.585 | 0.554 | 12.753 | 0.000 | 0.554 | 0.307 |
| Media | 0.331 | 0.437 | 9.302 | 0.000 | 0.437 | 0.191 |
| Public policy | 0.408 | 0.436 | 9.278 | 0.000 | 0.436 | 0.190 |
| Combined (Substructure II) | | | | | | |
| | Standardized Coefficient B | t-value | p-value<0.05 | R | R ² | Adjusted R ² |
| Knowledge | 0.287 | 6.662 | 0.000 | 0.724 | 0.525 | 0.518 |
| Cultural beliefs | 0.088 | 2.261 | 0.024 | | | |
| Family Support | 0.214 | 4.385 | 0.000 | | | |
| Friend Support | 0.169 | 3.561 | 0.000 | | | |
| Health facilities | 0.244 | 5.541 | 0.000 | | | |

Abbreviations: R, coefficient determinant.

problems in pregnant women can be prevented and detected by health workers during antenatal care visits. In Indonesia, pregnant women should attend four times (once in 1st trimester, once in 2nd trimester and twice in 3rd trimester), as stated in the national program.

Many theories and research findings indicate factors causing low antenatal care compliance include: education, knowledge, attitudes, perceptions, trust, economic status, social culture, family support, quality of health workers, competence, facilities, access, quality of service, distance to health facilities.^{18–22} Impacts caused by mothers and child health include anemia, hemorrhagic, hypertension, premature and low birth weight.^{23–26}

Each region has a different problem. So it is necessary to identify the contributing factors. Mothers must have the awareness to conduct antenatal care visits to check their pregnancy. If there is a risk during pregnancy, it can be handled early and appropriately by health workers. By then, we may expect the decline of MMR in Indonesia.

Knowledge and Cultural Beliefs

This study showed that knowledge and cultural beliefs contributed to Antenatal care compliance. The majority of respondents have low education so that health workers have difficulty doing health promotion for pregnant women. Pregnant women still use traditional birth attendant services

as an alternative to checking pregnancy for convenience reasons. They will go to health workers if the pregnancy is risky and cannot be handled by a shaman. It has become a family tradition.

Based on planned behavior and reasoned action of theory, individual behavior influenced by perceptions, norms, and culture.^{27,28} The level of education and work status affected their mindset. Mothers who are living in rural areas and having poor knowledge and social status tend to reduced antenatal care visits.^{29,30}

Because of the community trust to a shaman is profound, health workers need to collaborate in serving pregnant women. Start by mapping the number of pregnant women, health services, and health promotion. The goals are to reduce morbidity and mortality in pregnant women.

Family and Friend Support

Interpersonal factors significantly influence antenatal care compliance, especially family and friend support. The local culture in this area induces pregnant women to obey advice from their parents. It may influence decision making in choosing health services for pregnant women. In this area, the opinions of families, especially grandmothers, are still highly considered. There is a hereditary culture from their ancestors about habits that are not allowed for pregnant women. So it is difficult for health workers to provide health education for pregnant women.

Another study in Mexico City, which has relatively low socio-economic characteristics, found that women who did not live together with their husbands tended to receive family support.³¹ Therefore, families and people around pregnant women also need to be given health education to improve their knowledge. This process requires the participation of health workers in realizing this program.

Health Facilities

The study showed that health facilities and the availability of health professionals contributed to antenatal care compliance. The reason is the long distance to access health facilities. Public transportation is also an obstacle in this area, especially in four sub-districts, namely: Sungai Sembilan, South Dumai, Bukit Kapur and Medang Kampai. So for Antenatal care visit is still low. Even for the Sungai Sembilan sub-districts, they have to use a boat to go to a health facility. The availability of midwives is limited because of its rural areas. Communication, public facilities, and benefit finance is still the biggest obstacle in this area.

Research in Ethiopia also found the same reason, and another factor is financial constraints.³² The other factors, such as referral process, communication, midwife competence, also become obstacles in this area. Appropriate health professionals also determined indicators of the success of the public health facilities in carrying out its programs. The low quality of health services will hamper the growth and quality of life of the community.

Media

The study revealed that information from the media does not contribute to antenatal care compliance. The reason is because of the unavailability of supporting infrastructures such as electricity supply, road access, internet networks, and transportation. Whereas study in Canada said that the role of media was very influential in improving the participation of pregnant women in the health program. Examples of social media used were Facebook, Twitter, local online, online discussion forums, and websites.^{33,34}

The mass media industry is growing rapidly nowadays. That can be seen from television, radio, media companies, newspapers, magazines, and other media even though information about health for pregnant women was rare. Dumai City is a sub-urban area. Access to the province capital is within 6–8 hours. Electricity supply was also minimal. There are four sub-districts located in marginal areas, so that the use of mass media, television, and access

to health information is still lacking, especially the internet was useless.

Public Policy

This study demonstrated that public policy factor does not affect to antenatal care compliance. Some policies such as health insurance, health workers distribution, midwife competences, and finance or incentive system have proven not to support antenatal care visit compliance.

The role of the Health Ministry and the Regional Civil Foundation is crucial in the distribution regulation of health workers. Recruitment of health workers and infrastructural capacity to provide good quality care remains a challenge.³⁵ The placement and training of midwives in some areas are inadequate. The establishment of data-based programs still needs to be improved.^{36,37}

Relevant incentive patterns for health workers in the region can increase the interest and motivation to retain in the field. Some experts said that the provision of basic salary could only make employees feel safe, but unable to provide motivation. Incentives related to performance can increase motivation and productivity.^{38,39} The regulation of wages must be base on the characteristics and capabilities of local governments. Local governments must take low budget problems seriously so that the quality of health services will improve.

The commitment of the government can reduce the maternal mortality rate.⁴⁰ The participation of all institutions is needed, including the Ministry of Health of the Republic of Indonesia, Ministry of Finance, Dumai City Health Department, Primary Health Care, hospitals, and the participation of the whole community to commit to reducing maternal mortality in Indonesia.

Limitations

This study has some limitations. The design of this study was cross sectional. We can only come to the conclusion that five variable which were knowledge, cultural beliefs, family support, friend support, and health facilities support 51.8% of the model.

The categorization of the independent variables has several consequences, the inconsistency of the respondent answered because it is based on individual perceptions. The retrospective of an interview about antenatal care compliance may lead to recall bias. This research method should be combined or improved with a qualitative design to obtain more behavior observation or experiment design for future research.

Conclusion

Five factors in an ecological model of behavior, such as; knowledge, cultural beliefs, family support, friend support, and health facilities, contribute 51.8% of antenatal care visit compliance. We suggest that the level of knowledge and skills of pregnant women must be increasing as well as improves family and friends support the mother to come to antenatal care clinics. Future research should identify the barriers to prenatal care utilization to make a better program.

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Author Contributions

First authors contributed to data analysis and drafting. All authors revising the article, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

Disclosure

All authors have no conflict of interest related to conducting and reporting this study.

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