Journal of Epidemiology and Public Health (2025), 10(02): 243-251
Masters Program in Public Health, Universitas Sebelas Maret

Research
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Factors Associated with Pregnant Women's Compliance with Fit-to-Fly Recommendations at El Tari Airport in 2024

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Received: 11 February 2025; Accepted: 19 March 2025; Available online: 16 April 2025

ABSTRACT

Background: Fit-to-fly recommendations for pregnant women are regulated in Indonesia's civil aviation guidelines. Noncompliance may pose health risks for both mother and fetus during air travel. This study aimed to identify factors associated with pregnant women's compliance with fit-to-fly recommendations at El Tari Airport in 2024.
Subjects and Method: A cross-sectional study was conducted from January to March 2024 at El Tari Airport, Kupang. A total of 130 pregnant passengers who applied for fit-to-fly letters at the BKK Class I Airport Health Post were selected using simple random sampling. The dependent variable was compliance with fit-to-fly recommendations. Independent variables included maternal age, gestational age, parity, education level, travel reasons, document completeness, exposure to information, family support, and maternal knowledge. Data were collected using a structured questionnaire and analyzed using univariate, bivariate, and multivariate methods with multiple logistic regression.
Results: Gestational age (OR=6.79; 95%CI: 2.06–22.41; p=0.002), parity (OR=8.00; 95%CI: 2.61–22.54; p<0.001), education level (OR=5.49; 95%CI: 1.47–20.41; p=0.011), and maternal knowledge (OR=6.75; 95%CI: 2.13–21.34; p=0.001) were significantly associated with compliance. Other factors such as exposure to information, maternal age, document completeness, travel reasons, and family support showed no statistically significant association..
Conclusion: Gestational age, parity, education level, and maternal knowledge were significant determinants of compliance with fit-to-fly recommendations among pregnant women. These findings highlight the importance of targeted health education and screening prior to air travel during pregnancy.

Keywords: Airworthiness, Compliance, Flights, Gestational, Pregnant Women

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Cite this as:
Misnadin IW, Syamruth YK, Manurung IFE, Weraman P, Nayoan CR (2025). Factors Associated with Pregnant Women's Compliance with Fit-to-Fly Recommendations at El Tari Airport in 2024. J Epidemiol Public Health. 10(02): 243-251. https://doi.org/10.26911/jepublichealth.2025.10.02.10.

BACKGROUND

Life in the current Society 5.0 era is marked by rapid mobilization to meet various individual and societal needs. This increased mobility must be supported by the advancement of transportation infrastructure, including air travel, maritime shipping, and long-distance road transport. These modes of

transportation are designed not only for general purposes such as work and tourism, but also for specific cases like medical referrals, outbreak responses, and the transport of vulnerable groups such as the elderly and pregnant women, who often require special care during travel.

Air transportation has become one of the most preferred modes of travel today, surpassing land and sea transport in popularity (Langgar and Albanna, 2024). According to Article 9(e) of the Indonesian Ministry of Transportation Regulation No. 30 of 2021, commercial air transport operators are required to ensure that pregnant passengers possess a medical certificate stating their fitness to fly (Ministry of Transportation, 2021). Furthermore, Regulation of the Ministry of Health No. 424 of 2007 classifies pregnant women as a group eligible for air travel, provided they submit the necessary documentation, including a doctor's certificate and undergo pre-flight health screening (Ministry of Health, 2007).

In 2023, the number of domestic air passengers in Indonesia reached 57 million an increase of 20.66% compared to 47.3 million in 2022. Meanwhile, international air passenger numbers also rose significantly to 14.1 million, a 135.11% increase from 6 million in 2022 (BPS, 2024). At El Tari Airport in Kupang, East Nusa Tenggara, passenger traffic reached 1,252,131 in 2023, up from 1,190,628 in 2022 and 939,896 in 2021 (BKK Kupang, 2024).

Special attention is required for pregnant women traveling by air. At El Tari Airport, the number of pregnant travelers has shown a steady increase. In 2021, there were 249 pregnant passengers, of whom 162 met air travel eligibility criteria, while 87 were considered at-risk (i.e., traveling in the first or third trimester). In 2022, 517 pregnant women traveled by air, with 423 complying with regulations and 94 classified as at-risk. As of October 2024, 403 pregnant passengers had been recorded, including 300 compliant and 108 at-risk individuals (BKK Kupang, 2024).

Pregnant women are generally advised against flying after 36 weeks of gestation or during the first trimester. In the first trimester, fetal organogenesis is taking place, and the risk of maternal hypoxia during flight may adversely impact fetal development. Similarly, during the third trimester, air travel is discouraged due to the risk of hypoxia-related complications (Syougie, 2019). Therefore, this study aims to analyze the factors affecting compliance with fit-to-fly recommendations among pregnant women at El Tari Airport in 2024.

SUBJECTS AND METHOD

1. Study Design

This study employed a cross-sectional design, conducted between January and March 2024 at El Tari Airport, specifically at the Airport Health Post of the Class I Health Quarantine Center in Kupang, East Nusa Tenggara, Indonesia.

2. Population and Sample

The target population consisted of all pregnant women traveling by air through El Tari Airport in 2024, including both those who reported to the Health Quarantine Center and those who did not. The access population comprised pregnant women who processed a fit-to-fly letter at the Health Quarantine Post during the period January to December 2024.

A total of 130 respondents were selected using a simple random sampling method. The inclusion criteria were pregnant women who had recently traveled by air, non-referral cases, willing to participate and be interviewed. The exclusion criteria were pregnant women who had traveled by air more than once, travel for medical referral

purposes, unwillingness to participate in the study.

3. Study Variables

The dependent variable was Compliance with fit-to-fly recommendations for pregnant women. The independent variables were maternal age, gestational age, parity, education level, reason for travel, exposure to information, completeness of documents, family support, and maternal knowledge.

4. Operational Definition of Variables

Compliance with fit-to-fly regulations: Adherence to aviation rules requiring medical clearance and airworthiness certification for pregnant women.

Education level: The highest formal education attained by the respondent.

Maternal age: Age of the respondent at the time of obtaining the fit-to-fly letter, based on official identification.

Gestational age: Trimester of pregnancy at the time of travel, verified by a health professional.

Family support: Encouragement and assistance provided by family members in obtaining medical clearance for air travel.

Completeness of documents: Whether or not all required administrative and medical documents were submitted.

Parity: Number of times the respondent has given birth.

Information exposure: Whether the respondent had previously received information about air travel recommendations for pregnant women.

Maternal knowledge: Level of understanding regarding air travel eligibility requirements during pregnancy.

Reason for travel: The underlying motive for air travel (e.g., work, family, health).

5. Study Instrument

Data collection was conducted through structured interviews and document review using a questionnaire, which covered both dependent and independent variables. The questionnaire was administered in both paper-based and Google Form formats during the research period (January–March 2024).

6. Data Analysis

Data analysis was performed in three stages. Univariate analysis to describe respondent characteristics using frequency distribution tables. Bivariate analysis to explore associations between each independent variable and the dependent variable, using simple logistic regression. Multivariate analysis using multiple logistic regression to identify the most significant predictors of compliance with fit-to-fly recommendations among pregnant women.

7. Research Ethics

This study was approved by the Research Ethics Committee of the Faculty of Public Health, Universitas Nusa Cendana, Kupang, with the reference number: 000343/KEPK FKM UNDANA/2025.

RESULTS

1. Univariate Analysis

Table 1 presents the characteristics of the study participants. The majority of respondents were aged between 20 and 35 years (n = 73; 56.2%). Most respondents were in the first trimester of pregnancy (n = 101; 77.7%). Regarding educational background, 85.4% of respondents had completed high school or higher education. In terms of parity, 64.6% of the women were primigravida (had not previously given birth to a live baby).

The primary reason for travel was personal (n= 110; 94.6%). A total of 77.7% of participants brought complete documents when applying for the fit-to-fly letter. Information exposure related to airworthiness requirements was reported by 76.2% of respondents. Nearly all pregnant women received family support during the permit process (n=127; 97.3%). Lastly, 70% of participants demonstrated a high level of

knowledge regarding airworthiness requirements. Compliance with air travel recommendations was observed in 71.5% of respondents.

Table 1. Distribution characteristics responden at El Tari Airport in 2024 (N=130)

Variable	Category	Frequency (n)	Percentage (%)
Maternal Age	20–35 years	73	56.2
	<20 or >35 years	57	43.8
Gestational Age	First trimester	101	77.7
	Third trimester	29	22.3
Education Level	High school–University	111	85.4
	Elementary–Junior high school	19	14.6
Parity	No history of live birth	84	64.6
	≥1 live birth	46	35.4
Reason for Travel	Personal	110	84.6
	Work	20	15.4
Document Completeness	Complete	101	77.7
	Incomplete	29	22.3
Information Exposure	Exposed	99	76.2
	Not exposed	31	23.8
Family Support	Supportive	127	97.3
	Not supportive	3	2.7
Maternal Knowledge	High	91	70.0
	Low	39	30.0
Compliance with Recommendations	Compliant	93	71.5
	Non-compliant	37	28.4

Note: The ideal reproductive age is 20–35 years. Pregnancies below 20 and above 35 years are associated with higher obstetric risk (Ministry of Health, 2021; Dumilah, 2019)

2. Bivariate Analysis

The results of the bivariate selection test in Table 2 show that the variable reason for departure (OR= 3.91; CI95%= 0.85 to 13.11; p=0.402), and family support variables (OR= 3.54; CI95%= 0.15 to 41.96; p= 0.518) is not significant and is considered not to meet the requirements to be analyzed in the multivariate test (p>0.250).

Testing in Table 2 of the bivariate test, there were significant results in the maternal age variable (OR= 1.65; CI95%= 0.75 to 3.64; p=0.204), gestational age (PR= 7.06; CI95%= 2.86 to 17.38; p< 0.001), birth history (OR=4.12; CI95%=1.88 to 9.42; p= 0.000), education level (OR= 4.55; CI95%= 1.57 to 13.11; p= 0.005), information exposure (OR= 3.54; CI95%= 1.50 to 8.36; p= 0.004), and maternal knowledge (OR= 3.69; CI95%= 1.62 to 8.00; p=0.002).

Table 2. Bivariate Independent Variable Analysis Test with Fit-to-Fly Compliance in Pregnant Women

Variabel	OR	95%CI		p
		Lower Limit	Upper Limit	
Maternal Age	1.65	0.75	3.64	0.204
Gestational Age	7.06	2.86	17.38	0.000
Education Level	4.55	1.57	13.11	0.005
Parity	4.12	1.88	9.42	<0.001
Reason for Travel	3.91	0.85	13.11	0.042

Variabel	OR	95%CI		p
		Lower Limit	Upper Limit	
Document Completeness	1.43	0.57	3.59	0.443
Information Exposure	3.54	1.50	8.36	0.004
Family Support	3.54	0.15	41.96	0.518
Maternal Knowledge	3.69	1.62	8.00	0.002

3. Multivariate analysis

Test results in Table 3, It is known that in the gestational age variable (OR=6.79; CI95%=2.06 to 22.40; p=0.002) means that the gestational age variable has an effect on pregnant women's compliance with the airworthiness recommendations. The variable of birth history has a value of (OR=8.00; CI95%=2.61 to 24.54; p<0.001), meaning that the variable of childbirth history has an effect on pregnant women's compliance with the airworthiness recommendations. The variable level of education has a value (OR=5.49; CI95%=1.47 to 20.41; p=0.011), meaning that the variable level of education has an effect on the compliance of pregnant women with the recommendations of airworthiness. In the variable of maternal knowledge (OR=6.75; CI95%=2.13 to 21.34; p=0.001), meaning that the variable of maternal knowledge has an effect on pregnant women's compliance with the recommendations of suitability.

In the variable exposure of information (OR=1.90; CI95%= 0.51 to 7.09; p=0.337), maternal age variable (OR=1.92; CI95%=0.65 to 5.66; p=0.237), and the variable reason for departure (OR=16.97; CI95%= 0.95 to 301.61; p=0.054) has a p>0.050 so it is not significant or has no effect on compliance with the flyability recommendations in pregnant women.

Based on the results of the analysis in Table 3 of the regression model formed based on the estimated value of the parameter with a constant value of -16,341, the meaning of the negative sign is that if all independent variables, namely gestational age, childbirth history, education level, reason for departure and mother's knowledge are zero or constant, then compliance decreases by 16.34.

The gestational age regression coefficient of 1.96 means that a positive sign is that if the gestational age variable increases, then the compliance variable will increase, and vice versa. The regression coefficient of childbirth history is 2.08, which means that a positive sign is that if the variable of childbirth history, then the compliance variable will increase, and vice versa. The regression coefficient of education level is 1.70, which means that a positive sign is that if the education level variable increases, then the compliance variable will increase, and vice versa. The mother's knowledge regression coefficient of 1.91 means that a positive sign is that if the mother's knowledge variable increases, then the compliance variable will increase, and vice versa.

Table 3. Results of Multiple Logistic Regression Analysis of Independent Variables Associated with Compliance with Fit-to-Fly Recommendations Among Pregnant Women

Variabel	OR	95%CI		p
		Lower Limit	Upper Limit	
Information Exposure	1.90	0.51	7.09	0.337
Maternal Age	1.92	0.65	5.66	0.237
Gestational Age	6.79	2.06	22.40	0.002
Parity	8.00	2.61	24.54	<0.001

Variabel	OR	95%CI		p
		Lower Limit	Upper Limit	
Education Level	5.49	1.47	20.41	0.011
Reason for Travel	16.97	0.95	301.61	0.054
Maternal Knowledge	6.75	2.13	21.34	0.001

DISCUSSION

This study found that maternal age was not significantly associated with pregnant women's compliance with the Fit-to-Fly recommendations at El Tari Airport, Kupang. The majority of respondents were aged between <20 to 35 years (73 respondents), with 57 respondents specifically aged 20–35 years. This suggests that maternal age does not determine compliance in obtaining Fit-to-Fly certification for pregnant women. The optimal reproductive age is considered to be between 20–30 years; pregnancies outside this range (<20 or >35 years) are associated with increased maternal and fetal risks. Advanced maternal age has been linked to adverse pregnancy outcomes, even among otherwise healthy women (Dumilah, 2019). Nonetheless, this finding aligns with studies by Irmawan (2021) and Hananto (2021), which showed no significant association between age and compliance with health protocols (p= 0.27 and p = 0.550, respectively).

Despite this, Ram et al. (2020) reported contrary findings, noting that maternal age significantly influenced willingness to travel by air (p= 0.001), especially when mothers understood the potential risks of air travel on gestational age and birth weight. The present study also revealed that gestational age significantly influenced compliance with Fit-to-Fly recommendations. Pregnant women in their first trimester had undergone physical examinations prior to air travel, in line with aviation regulations. It is known that air travel is not recommended during the first and third trimesters due to specific physiological risks. During the first trimester, organogenesis is underway, and the mild hypoxia during flight may interfere with fetal development (Syougie, 2019). In the third trimester, changes in cabin pressure may trigger contractions.

This finding supports research by Ram et al. (2020) and Hezelgrave et al. (2011), both of which emphasized the importance of gestational age in the context of pre-travel medical examinations. However, Nechval and Antony (2023) found no such association in the U.S. for domestic flights, possibly due to shorter flight durations and a lack of repeated travel needs.

Educational attainment was another significant factor influencing compliance. Of 130 respondents, 111 had a higher level of education (senior high school or above), and 77.5% of this group were compliant with the recommendations. A total of 88 respondents with higher education actively sought information regarding flight regulations during pregnancy. This aligns with Irawan (2023) and Hananto (2021), who found that higher education levels were associated with better adherence to health protocols (p< 0.001 and p = 0.016, respectively).

Parity was also found to be a significant predictor of compliance. Of 130 respondents, 84 had not previously delivered a live baby, while 46 had delivered at least once. Primigravida mothers were more attentive to medical procedures, perceiving them as essential. This aligns with findings from Nechval and Antony (2023) (p= 0.018), as well as Chibber et al. (2006), who noted that air travel during pregnancy can lead to premature birth and low birth weight. Conversely, Grajewski et al. (2015)

found no significant association between parity and the decision to seek flight clearance.

Despite regulations issued by the Indonesian Ministry of Health (2024), which require a valid ID card, a doctor's certificate, and flight booking proof for pregnant travelers, this study found no significant association between document completeness and compliance. While 101 respondents had complete documentation, 29 did not. Nevertheless, most mothers carried essential documents such as an ID card, plane ticket, recent medical examination results, and the maternal health record book. These findings are consistent with Dwicandra (2019), who found that some pregnant passengers at Ngurah Rai Airport traveled without formal medical clearance. However, this contrasts with studies indicating that airline services at Yogyakarta International Airport have effectively informed passengers about travel requirements, even though some passengers still lacked knowledge.

This study also found no significant association between travel purpose and compliance (p= 0.054). A total of 110 pregnant women traveled for personal reasons (e.g., holiday, family visit), while 20 did so for work. Many non-compliant respondents had planned their trips in advance and opted for online check-in, thus bypassing medical screening at the airport. Matteelli et al. (2012) noted that air travel during pregnancy is common between 14 and 28 weeks, and that pre-travel consultation is necessary. Another study reported that travel purpose (business or visiting relatives) significantly influenced pregnant women's adherence to pre-travel medical care ($p < 0.010$).

Exposure to information on Fit-to-Fly also showed no significant association with compliance. Among 130 respondents, 99 had been exposed to relevant information, while 31 had not. However, 21 of the informed respondents were still non-compliant. This could be due to reliance on the airline's requirement for a physician's certificate, which sometimes bypasses quarantine health center screening. Interestingly, 16 of the uninformed respondents were compliant, possibly because they were directed by airport health officers to obtain proper documenttation during check-in. According to Hagmann et al. (2017), 63.4% of pregnant travelers in the U.S. chose not to seek pretravel advice, believing that travel posed no risks. In contrast, 60.5% of informed respondents consulted an obstetrician. Paozah (2021) emphasized the lack of awareness among pregnant travelers regarding standard operating procedures. Therefore, providing accessible information is crucial for public health promotion.

This study also found no significant association between family support and compliance (p=0.518). A total of 127 respondents reported receiving family support, including emotional, psychological, and logistical support. However, both compliant and non-compliant respondents reported similar levels of support. This is consistent with Wahyuni (2022), who found no significant association between family support and maternal health behavior (p = 0.174). Lindasari et al. (2023) highlighted the importance of family in providing a sense of safety, encouragement, and autonomy for pregnant women.

Finally, maternal knowledge significantly influenced compliance. Of the 110 compliant respondents, 73 had high knowledge levels. This supports Irmawan (2021), who found that knowledge was a key factor influencing adherence to health protocols (p= 0.033). Health education campaigns and information from quarantine health officers played a key role in raising awareness among pregnant travelers.

In conclusion, this study identified several significant predictors of pregnant women's compliance with Fit-to-Fly recommendations at El Tari Airport in 2024, namely gestational age, educational attainment, parity, and knowledge. On the other hand, maternal age, document completeness, travel purpose, information exposure, and family support were not significantly associated with compliance. These findings highlight the need for targeted interventions—such as educational programs, counseling, and media campaigns—tailored to pregnant women, particularly those with vulnerable gestational ages, lower educational backgrounds, or no prior childbirth experience. Efforts should be made by health authorities, government institutions, and airlines to ensure that pregnant women are informed and empowered to undergo appropriate pre-travel screening in order to protect both maternal and fetal health.

AUTHOR CONTRIBUTION

Concept, research methodology, data collection, data analysis and interpretation by Indri Wahyuningsih Misnadin. Supervision, Review, Final Finalization of the Manuscript Yendris K. Syamruth, Imelda F.E Manurung. Manuscript approval by: Yendris K. Syamruth, Imelda F.E Manurung, Pius Weraman, Christina R. Nayoan.

ACKNOWLEDGMENT

Author would like to thank the Head of BKK Class l Kupang and PT. Angkasa Pura Eltari Kupang Airport who has been willing to provide permits and data during the research, as well as all parties who have helped the smooth preparation of this thesis proposal, both directly and indirectly.

FUNDING AND SPONSORSHIP

This article was self-funded by researchers.

CONFLICT OF INTEREST

I hereby declare that there is no conflict of interest where this research is carried out without commercial and financial concerns that can be a potential conflict of interest in the future.

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