

Analysis of Factors Related to Bone Density in Trimester III Pregnant Women in The Working Area of Community Health Center of Andalas Padang

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ABSTRACT

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The decrease of bone density becomes a serious health problem because of its increasing prevalence worldwide, especially for women. Parity is one of the factors that can affect bone density, apart from physical activity, consumption of caffeinated and carbonated drinks, intake of protein, magnesium, phosphorus, calcium, and serum 25(OH)D levels. This study aimed to comprehensively analyze the factors associated with bone density in pregnant women. This cross-sectional study was conducted in the working area of Community Health Center of Andalas Padang towards 73 pregnant women in the third trimester with a purposive sampling technique. Structured interviews were conducted by using a semi-quantitative food frequency questionnaire (nutritional intake), Baecke's questionnaire (physical activity) and examination of serum 25(OH)D levels using the ELISA method. Data were analyzed by using One Way ANOVA, Kruskal-Wallis test and multiple linear regression. The results of statistical tests showed that there was no significant relation ($p > 0.05$) among parity, physical activity, serum 25 (OH) D levels, consumption of caffeinated and carbonated drinks, intake of protein, phosphorus, magnesium, and calcium on bone density at pregnant women. The dominant factor related to bone density are parity ($adjusted R^2=0,191$; $standardized \beta coefficient= -0,357$; $p=0,004$) and calcium intake ($adjusted R^2=0,191$; $standardized \beta coefficient=0,308$; $p=0,005$). The conclusion of this study is that calcium intake and parity play important roles in bone density in pregnant women.

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1. Introduction

The decrease of bone density becomes a serious health problem because of its increasing prevalence worldwide, especially for women. Bone density varies according to age; increasing in the first part of life and decreasing gradually after adulthood. There is evidence that factors such as lack of physical exercise, lifestyle (excessive coffee and soda consumption habits) and the effects of poor calcium, protein, magnesium and phosphorus intake have detrimental effects on bone mineral mass. (Sherwood L, 2011). Normal metabolism of bone also depends on the presence of vitamin D and is accompanied by calcium. Low levels of calcium and vitamin D in tissues can interfere with the ability of bones to respond optimally (Daroszewska, 2015). Parity is also a factor affecting bone density in women. This is because during pregnancy and breastfeeding, some of the mother's bone calcium will be absorbed for the needs of her baby (Zahoor, 2010). This study aims to comprehensively analyze the factors associated with bone density in third trimester pregnant women.

2. Method

This cross-sectional study was conducted in the working area of Community Health Center of Andalas Padang towards 73 pregnant women in the third trimester with a purposive sampling technique that met the inclusion criteria. Structured interviews were conducted by using a semi-quantitative food frequency questionnaire (nutritional intake), Baecke's questionnaire (physical activity) and examination of serum 25(OH)D levels using the ELISA method. Data were analyzed using the One Way Anova, Kruskal-Wallis test and multiple linear regression.

3. Results and Discussion

The results of statistical tests revealed that there was no significant relation ($p > 0.05$) among parity, physical activity, serum 25(OH)D levels, consumption of caffeinated and carbonated drinks, intake of protein, phosphorus, magnesium, and calcium on bone density at pregnant women. However, when viewed from a detailed test, it was found that age, parity, serum 25(OH)D levels, phosphorus intake, calcium intake and caffeinated drinks had a significant relation with the bone density of pregnant women.

Table 1.
Analysis of factors related to bone density in pregnant women (n=73)

Independent Variable	Bone Density						Value of p*
	Tartile 1 n= 26		Tartile2 n= 24		Tartile3 n= 23		
	Median	IQR	Median	IQR	Median	IQR	
Age (year)	32.00	6.25	30.50	9.75	27.00	10	0.176
Parity (child)	2.00	2.00	2.00	1.00	1.00	2.00	0.109
Physical Activity (score)	5.75	1.42	6.15	1.45	5.80	1.40	0.696
Serum 25(OH)D Levels (ng/mL)	19.70	13.35	20.15	20.15	21.10	12.7	0.998
Carbonated drinks (mg/1000 kcal/day)	0.00	0.00	0.00	0.00	0.00	0.00	0.383
Protein Intake (g/1000 kcal/day)	41.45	7.82	39.00	8.00	40.10	10.40	0.598
Phosphorus intake (mg/1000 kcal/day)	622.25	120.97	598.95	136.22	581.40	163.60	0.260
Magnesium intake (mg/1000 kcal/day)	114.55	21.32	111.80	35.00	114.20	25.20	0.357
	Mean	SD	Mean	SD	Mean	SD	
Calcium intake (mg/1000 kcal/day)	283.08	63.27	289.67	116.32	322.84	140.78	0.234
Caffeinated drinks (mg/1000 kcal/day)	51.84	35.34	51.72	26.57	50.77	37.83	0.992

* Kruskal-Wallis test

Table 2.
Dominant factors related to bone density in third trimester pregnant women based on multiple linear regression analysis (n=73)

Adjusted R ²	Variable	Unstandardized coefficients		Standardized β coefficient	95% CI for β		p-value
		B	Standard error		lower bound	Upper bound	
0,191	Constant	-0,365	0,442				0,010
	Age	-0,007	0,015	-0,055	-0,297	0,187	0,65
	Parity	-0,206	0,07	-0,357	-0,598	-0,116	0,004
	Calcium intake	0,002	0,001	0,308	0,095	0,521	0,005

From the several factors that have been studied, the variables of age, parity and calcium intake are the most significantly associated with bone density in pregnant women with the value of $R^2 = 0,191$ which means that 19.1% of bone density is determined by age, parity and calcium intake. Among the three factors, the factors that most dominantly influence the bone density of pregnant women are parity factor and calcium intake by value of $p < 0,05$.

3.1 Discussion

From the several factors that have been studied, the variables of age, parity and calcium intake are the most significant factors associated with bone density in pregnant women with the value of

$R^2 = 0,191$ which means that 19.1% of bone density is determined by age, parity and calcium intake. The standardized β coefficient for maternal age was -0.055 , which means that each additional maternal age, maternal bone density will also decrease by as much as 0.05 on the number of maternal bone density T-score. The standardized β coefficient on maternal parity was -0.383 , which means that for each addition of 1 child, the mother's bone density would also decrease by 0.38 on the number of maternal bone density T-score. The standardized β coefficient of calcium intake is 0.308, which means that every time you consume 1 mg/day of calcium intake, it will increase bone density by 0.30 on the number of T-Score for maternal bone density.

Among the three factors, the dominant factors related to bone density of pregnant women were parity and calcium intake with p value of <0.05 . Parity is a factor of osteoporosis because the formation of the fetal skeleton will take up 3% of the mother's bone calcium (Weaver and Henaey, 2008). In addition, daily calcium transfer during breastfeeding continues to increase after delivery; therefore, it is important to maintain calcium intake during pregnancy and breastfeeding (Fitria, 2016). This proves that the increasing parity will decrease bone density if it is not balanced with adequate calcium intake. Calcium intake plays an important role in maintaining bone health. The higher the calcium intake, the denser the bone mass (Kendall, 2014). During pregnancy, there is an increased need for calcium. Parathyroid hormone plays a role in increasing calcium absorption in the intestine to meet the needs of the fetus (Kovacs, 2006). Therefore, it is important to maintain calcium intake during pregnancy and breastfeeding, because some of the mother's bone calcium will be absorbed for the needs of the fetus or baby during pregnancy and breastfeeding.

4. Conclusion

The conclusion of this study is that calcium intake and parity play an important role in bone density in pregnant women and are the dominant factors affecting bone density in pregnant women.

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