

Original Research Paper

Areca nut consumption on the number of children in couples of childbearing age

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Abstract

Papuans have a propensity of eating areca nuts. Chewing areca nuts was historically associated with the life of the elderly. However, areca nuts have recently gained popularity among young people in Papua. In Papua, the habit of eating betel nuts, or areca nuts, has been passed down from generation to generation for centuries. This study examines the correlation between areca nut consumption and the number of children among reproductive-age couples at the Public Health Center of East Sorong Work Region. This is a correlational study conducted using a cross-sectional design. We used a questionnaire about areca nut consumption habits and the number of children in reproductive-age couples. To test the hypothesis, bivariate analysis was utilized to determine whether there was a correlation between the independent and dependent variables using the Chi-Square test (X^2). Based on the results, we found that the wife's habit of consuming areca nuts does not correlate with the number of children, while the husband's habit has a p-value <0.05 . This indicates a correlation between consuming areca nuts had a significant effect on the number of children, with a p-value of $0.000 < 0.05$ for the husband's habits and $0.031 < 0.05$ for both habits. We believe that husbands who consume areca nuts frequently will affect the quality of sperm, which might result in impaired fertility and a decrease in the number of children.

Keywords: areca nut consumption; number of children; reproductive-age couple

1. Introduction

In Papua, the tradition of eating areca nuts is thought to promote brotherhood. Men, women, and even teenagers do this. This tradition, which does not recognize socioeconomic classes, places great importance on brotherhood and a strong sense of sociality that cannot be substituted by anything else. Giving birth is required in all formal and informal contexts, particularly among traditional leaders. Not being an inhabitant implies you are not a customary child. As a result, betel, areca nut, and lime are always brought by traditional elders at every event. They use betel and areca nuts to communicate with others and interact with their surroundings (Dhurorudin Mashad, 2020).

Davis and Blake argue that social, economic, and cultural factors can influence fertility. Furthermore, Easterlin proposed an economic theory of fertility in which the desire for children is influenced by individual background characteristics such as religion, education, employment, place of residence, income, etc. Every household has fertility norms and attitudes that are driven by the traits listed above. In addition, Easterlin believes that natural fertility is influenced by both physiological or biological factors and cultural traditions (Penelitian et al., 2016).

Papuans have a propensity of eating areca nuts. Chewing areca nuts was historically associated with the life of the elderly. Areca nuts have recently gained popularity among young people in Papua. In Papua, the habit of eating betel nuts, or areca nuts, has been passed down from generation to generation for centuries. Areca nut and betel not only help preserve healthy gums and teeth but also represent

connection and fraternity among Papuans. It is not unexpected that if there is a large occasion, such as a wedding or death, areca nuts are a treat that the event organiser must offer (Sri Noviyanti, 2019).

Elderly ladies typically carry out the tradition of chewing areca nuts. However, in Papua, this custom begins in childhood and is passed down from generation to generation, from the older to the younger. In truth, this practice began at the age of seven and will continue until someone grows old and dies.

According to a World Health Organization (WHO) report, ingesting betel nuts might cause cancer, which affects both the mother and the baby at birth. The chemicals found in betel leaves and areca nuts may also raise the chance of miscarriage and fetal abnormalities. Aside from triggering cancer, betel nut can cause excessive connective or fibrous tissue in the submucosa (Annisa Karnesyia, 2019).

Shrestha et al. (2010) investigated the effect of an ethanol extract of *A. catechu* on the length of various oestrous cycle stages, ovarian weight, cholesterol levels, and histopathology in mice. During the estrus cycle, several physiological, biochemical, morphological, and histological changes occur in the ovaries, disrupting the formation of secondary follicles and thereby influencing estrogen production and corpus luteal maturation. Hormonal disruption might influence a person's ovulation and menstruation condition (Akmal et al., 2010).

Another study conducted by Akmal et al. (2018) on the effects of areca nut exposure on rat spermatozoa motility found that areca nut seeds produce arecoline, which is known to cause cytotoxicity in various mammalian cells, increase mitochondrial membrane potential hyperpolarization, and induce DNA fragmentation. Arecoline alters gonad morphofunction in male mice, causes spermatozoa abnormalities in sheep, and inhibits DNA synthesis in germ cells and other cells (Akmal et al., 2018), in humans and in male chickens (Susila, 2013). Furthermore, Kiong-Er et al. found that in vitro arecoline induction reduced spermatozoa motility (Akmal et al., 2018).

Other study (Yanis Musdja et al., 2012) Shows that areca nut extract obtained from the process of chewing areca nuts is very beneficial to the body's defense system (as an immunomodulatory effect), as well as the growth of gram-positive bacteria (*Staphylococcus aureus*) found in the upper respiratory tract and skin. Aside from that, it can prevent additional acne-related growth.

Consider areca nuts as a combination consumed with betel, which has been a custom for generations in certain regions of Indonesia. This also applies to the residents of Sorong City, the majority of whom consume areca nuts as an ingredient without realizing the benefits of using them. Research on betel nuts has shown that they can boost the body's defensive system by increasing gram-positive bacteria in the upper respiratory tract and skin, preventing acne growth, and diminishing sperm motility.

The findings of the study (Akmal et al., 2018) which demonstrated that areca nut can lower sperm motility, piqued researchers' interest in performing additional research on the effect of areca nut consumption in reproductive-age couples on the number of children produced. This study aims to determine the correlation between the two by collecting data in the form of areca nut consumption habits of reproductive-age couples and the number of children born.

Several components in areca nuts (alkaloids, flavonoids, tannins, and lignin) have anti-inflammatory and antioxidant activities. These activities are sometimes linked to reproductive health and fertility when consumed long term (Redaksi Trubus, 2024).

2. Research Methods

This correlational study with a cross-sectional research design was carried out from March to October 2022 at the Public Health Center of East Sorong Work Region. The study included all 418 reproductive-age couples in the center. The sampling technique was simple random sampling, with a total of 387 reproductive-age couples providing responses. Data gathering involved coordinating midwives and students directly, with respondents' prior consent. The collected data was evaluated and

statistical tests were performed using the Chi-Square test to see whether there was a correlation between the consumption of areca nuts and the number of children in reproductive-age couples.

3. Result and Discussion

3.1.Result

This study can be carried out in accordance with the previously scheduled research timetable. It also has received a research permit as well as an ethical clearance from the Ethics Commission of Poltekkes Kemenkes Sorong. The study was conducted in the Public Health Center of East Sorong Work Region between March and October 2022, with 387 reproductive-age couples who consumed areca nuts.

3.1.1.Univariate Analysis

Table 1. Respondent Characteristics

No	Characteristic	n	%
A.	Wife's Age (Year)		
	20-48	357	92.2
	49-54	12	3.1
	> 54	17	4.4
B.	Husband's Age (Year)		
	20-48	328	84.8
	49-54	29	7.5
	> 54	30	7.8
C.	Length of Marriage (Year)		
	0 - 10	247	63.8
	11 - 20	64	16.5
	> 20	76	19.6
D.	Number of Children		
	Few (≤ 2)	161	41.6
	Moderate (3-5)	127	32.8
	Many (≥ 6)	99	25.6

Source: Primary Data, 2022

Table 1 shows the characteristics of the respondents. The wife's age is mostly 20-48 years (reproductive age), 92.2%, and the husband's age is mostly 20-48, 84.8%. This demonstrates that the majority of respondents in this study were childbearing-and-productive-age couples. Meanwhile, those aged 49 to 54 were at least wife (3.1%) and husband (7.5%).

According to this study's findings, the majority of respondents had been married for a maximum of 0-10 years (63.8%) and at least 11-20 years (16.5%). Meanwhile, the few categories had the most children (41.6%), while the many categories had the fewest, 25.6%. This is a contributing component in studies to determine whether the practice of eating areca nuts before marriage affects the number of children.

3.1.2. Bivariate Analysis

3.1.2.1. Correlation between wife's habit of consuming areca nuts and the number of children

The table below shows the correlation between the wife's consumption of areca nuts and the number of children.

Table 2. Cross-tabulation of the correlation between the wife's habit consumption of areca nuts and the number of children

No	The habit of consuming areca nut	Number of children						Total	
		Few		Moderate		Many		n	%
		n	%	n	%	n	%	n	%
1	Yes	111	35.9	112	36.2	86	27.8	309	100
2	No	50	64.1	15	19.2	13	16,7	78	100
	<i>p</i> -value	0.081							

Source: Primary Data, 2022

According to Table 2, respondents who consume areca nuts regularly have fewer children (35.9%) than those with more children (27.8%). Meanwhile, individuals who did not consume areca nuts had few children (64.1%). Statistical tests using Chi-Square revealed a significant correlation (p -value < 0.05) between areca nut consumption and the number of children in reproductive-age couples at the Public Health Center of East Sorong.

3.1.2.2. Correlation between husband's habits of consuming areca nuts and number of children

The following table shows the correlation between the husband's consumption of areca nuts and the number of children.

Table 3. Cross-tabulation of the correlation between the husband's habit consumption of areca nuts and number of children

No	The habit of consuming areca nut	Number of children						Total	
		Few		Medium		Many		n	%
		n	%	n	%	n	%	n	%
1	Yes	112	40.6	96	34.8	68	24.6	276	100
2	No	49	44.1	31	27.9	31	27.9	111	100
	<i>p</i> -value	0.000							

Source: Primary data (2022)

Based on Table 3, husbands who regularly consume areca nuts have the fewest children (40.6%), whereas those who do not have a big number of children (24.6%). Meanwhile, respondents who did not consume areca nuts had a few proportion of children (44.1%). According to the results of statistical tests using Chi-Square, the p -value was $0.425 > 0.05$, indicating that there was no correlation between the husband's habit of consuming areca nuts and the number of children in reproductive-age couples in the Public Health Center of East Sorong Work Region.

3.1.2.3. Correlation between the Habits of Husband and Wife (Both) Consuming Areca Nuts and the Number of Children

The table below shows the correlation between husband and wife's habit of consuming areca nuts and the number of children

Table 4. Cross tabulation of the correlation between husband and wife's habit consumption of areca nuts and number of children

No	The habit of consuming areca nut	Number of children						Total	
		Few		Medium		Many		n	%
		n	%	n	%	n	%	n	%
1	Yes	83	36.6	85	37.4	59	26.0	227	100

2	No	78	48.8	42	26.3	40	25.0	160	100
	<i>p</i> -value	0.031							

Source: Primary data (2022)

According to Table 4, respondents who consumed the most areca nuts had the fewest children (36.6%), while those who consumed the fewest had the most children (26%). Meanwhile, those who did not consume areca nuts had fewer children, at 48.8%. Statistical tests using Chi-Square revealed a significant correlation (p -value = 0.031 < 0.05) between reproductive-age couples' consumption of areca nuts and their number of children in the Public Health Center of East Sorong Work Region.

3.1.2.4. Correlation between length of marriage and number of children

The following table shows the correlation between length of marriage and number of children.

Table 5. Cross tabulation of the correlation between length of marriage and the number of children

No	Length of marriage	Number of children						Total	
		Few		Medium		Many		n	%
		n	%	n	%	n	%		
1	0-10	127	51.4	87	35.2	33	13.4	247	100
2	10-20	10	15.6	14	21.9	40	62.5	64	100
3	>20	24	31.6	26	34.2	26	34.2	76	100
	<i>p</i> -value	0.000							

Source: Primary data (2022)

According to Table 5, respondents who have been married for 10-20 years have a significant number of children (62.5%), whereas respondents who have been married for 10-20 years have the fewest children (15.6%).

3.2. Discussion

The areca nut plant (*Areca Cathecu L*) is a versatile plant with numerous uses, including the leaves, stems, fibers, and fruit seeds. Much research have found that chewing areca nuts provides health benefits (Silalahi & Biologi, 2020). Areca plants are classified into the Spermatophyta division, Angiospermae subdivision, monocotyledoneae class, areca genus, and areca catechu L type (Suryo, 2016). According to Kambu et al., it was once customary for Papuans, particularly in Jayapura City, to use areca nuts to induce abortions about 80 years ago (around the eighteenth century) by eating areca nuts, areca nut juice, and specific leaves known as “*charo-tidja*”. The abortion was performed because the child being conceived was thought to be the devil's child or because the child was the consequence of a liaison with someone other than her husband.

In this context, areca nut serves as an alternative treatment for aborting an unwanted pregnancy (apart from massage, eating ashes, or eating food that has been spelled) (Halimah et al., 2022). According to the results of statistical tests employing Chi-Square, there is a correlation between the consumption of areca nuts and the number of children in reproductive-age couples in the Public Health Center of East Sorong Work Region in Sorong City. Respondents who consume areca nuts, both husband and wife, have few children. Aside from linking their consumption patterns, we also linked one of them (husband or wife)'s consumption of areca nut to the number of children. After evaluating one of them, it was discovered that the wife's habit of eating areca nuts was more significant than the other two. Of the 378 respondents, 309 wife ate areca nuts, whereas 112 had a moderate number of

children and 111 had a few number of children. According to Hartoyo et al., the following factors influence the number of children: the mother's age, the mother's education, the mother's employment position, family per capita income, the education of the head of the household, and the children's grades. In addition, Easterlin believes that natural fertility is influenced by both physiological or biological elements and cultural practices (Hartoyo et al., 2011).

According to Davis and Blake, fertility-influencing variables include both direct and indirect variables, such as social, economic, and cultural influences. Social, economic, and cultural elements influencing fertility will be those that are directly related to the three stages of reproduction: intercourse (sexual intercourse), conception (fertilization of egg cells by sperm cells), and gestation (pregnancy). Furthermore, Easterlin (in Mantra 2010) stated that background characteristics including beliefs of the worth of children, religion, living conditions, education, work status, age at first marriage, income, and infant/child mortality all impact fertility. Every family has fertility norms and attitudes depending on the variables listed above (Jaya & Ranatwati, 2022).

Chewing areca nut with betel, lime, gambier, and other ingredients produces an effect similar to that of smoking, drinking coffee, or tea. The perfect combination can turn lips crimson and create a taste sensation that might be addictive (for consumer). Aside from its health benefits, chewing areca nut is a behavior in Papuan civilization that holds wisdom values passed down through centuries. Areca palm trees provide numerous benefits to mankind in terms of ecology, socioculture, and economics (Khasanah et al., 2024).

Areca nut seeds are elongated inverted egg-shaped, orange red, 3.5-7 cm long, with fibrous fruit walls. Seed 1 is egg-shaped, and has a mesh-like appearance. Areca seeds taste bitter, spicy and warm and contain 0.3-0.6% alkaloids, such as arecoline ($C_8H_{13}NO_2$), arecolidine, arecaine, guvacoline, guvacine and isoguvacine. Apart from that, it also contains 15% red tannin, 14% fat (palmitic, oleic, stearic, caproic, caprylic, lauric, myristic acid), starch and resin. Fresh seeds contain approximately 50% more alkaloids than treated seeds (Ulung, 2014).

According to Garg et al, areca nut damages nearly every organ in the human body, including the brain, heart, lungs, digestive tract, and reproductive organs. This causes or exacerbates pre-existing illnesses such as nerve injury, myocardial infarction, cardiac arrhythmia, hepatotoxicity, asthma, central obesity, type II diabetes, hyperlipidemia, metabolic syndrome, and so on. Areca nuts have an effect on the endocrine system, resulting in hypothyroidism, prostatic hypertrophy, and infertility. It affects the immune system, reducing T cell activity and cytokine release. It has a negative impact on the fetus if consumed while pregnant (Garg et al., 2014).

According to Javed et al, consumers reported chewing AC (*Areca catechu*) anywhere between once and 76 times per day. The duration of consumption varied from 6 to ≥ 20 years. The habit of chewing *Areca catechu* is linked to hyperglycemia and type 2 diabetes. It links to obesity and a higher body mass index and may be linked to metabolic syndrome, specifically diabetes mellitus and obesity (Javed et al., 2019).

Sri Anggraeni et al. proved that obese women are more likely to experience infertility. Of the 105 obese women, 85 (80.95%) experienced infertility. Being overweight can disrupt the fertilization, pregnancy, and birth processes, and it is possible to develop ovulation and embryo implantation disorders (Anggraini et al., 2015).

Animal studies show that acute intake of arecoline increases the release of T3, T4, and suppresses thyroid-stimulating hormone (TSH); in large doses, it activates the hypothalamic-pituitary-adrenal (HPA) axis, similar to a stress response, and causes hypothyroidism if used regularly (Saha et al., 2011). Plasma melatonin concentrations decrease after regular areca nut consumption, while serotonin levels increase. Areca nut increases testosterone levels, but this effect is not seen with betel use. Areca nut increases the concentration of sialic acid in the seminal vesicles and fructose in the coagulation glands,

as well as the expression of androgen receptors in the prostate, resulting in prostate enlargement (Saha et al., 2011). Areca nut reduces sperm motility, sperm count, sperm abnormalities, and antioxidant enzyme activity, and if used for an extended period of time, it can lead to infertility (Wu et al., 2010). Women who chew betel nuts on a regular basis have stable levels of the female hormones progesterone and estradiol in their saliva (Nunez-de et al., 2006). Areca consumers suffer from vitamin D deficiency worsened by the strong effect of increasing 25(OH)ase expression, resulting in a decrease in serum calcitriol because areca nut has an independent effect on 25(OH)ase (Ogunkolade et al., 2006).

According to Sumarsono, betel nuts have the potential to act as an antifertility substance by inducing apoptosis in spermatogenic cells. This is supported by research conducted on male mice divided into five treatment groups: control, solvent control (1% gum arabic), P1 = use of young areca nut ethanol extract at a dose of 500 mg/kgbb, P2 = use of ethanol extract young areca nut seeds at a dose of 300 mg/kgbb, and P3 = use of young areca nut seed ethanol extract at a dose of 700 mg/kgbb, and then apoptosis was observed. The observation results revealed that: 1) there was a decrease in the relative weight of the testes in the P3 group; 2) the size of the testes was relatively smaller in the treatment group; 3) differences in the structure of the testicular tissue in the P2 and P3 groups, i.e., (a) the number of seminiferous tubules was less, (b) the diameter of the seminiferous tubules is smaller, (c) the distance between the seminiferous tubules is more distant, and (d) a decrease in the areca nut ethanol extract induces apoptosis and has potential as a natural male antifertility agent (Sumarsono et al., 2018).

Areca nut has a bitter, spicy, and toasty flavor and contains 0.3–0.6% alkaloids. In addition, it includes 15% red tannin, 14% fat (palmitic, oleic, stearic, caproic, caprylic, lauric, myristic acid), starch, and resin. Fresh seeds have roughly 50% more alkaloids than treated seeds. In this situation, Arecoline acts as a sedative, making it intoxicating for consumer. The chemical component of the areca nut plant (alkaloids) contains poisons and tranquilizers, hence it is not suggested for usage in excessive numbers (Dalimartha, 2009).

According to Aburizal (2018), the antioxidants in areca nut extract can protect against free radicals, reducing the occurrence of lipid peroxidation, which can damage the spermatozoa plasma membrane, resulting in decreased motility and spermatozoa death. In other studies, areca nut extract was used to reduce spermatozoa motility. According to Akmal et al. (2018), exposure to the water fraction of areca seed extract by force-feeding directly into the stomach of mice caused a decrease in mouse spermatozoa motility due to the action of the alkaloid bioactive ingredients contained in areca nut seeds.

Areca nut seeds have substantially higher antioxidant activity than the fruit's skin. When extracted with ethanol, they have good antioxidant activity (Zhang et al., 2014). Areca nuts contain tannin. Catechol tannin is the most common tannin found in these seeds (Meutia, 2019). Areca nut seeds include alkaloids such as arecoline ($C_8H_{13}NO_2$), arecolidine, arecaine, guvacoline, guvacine, and isoguvacine. The ethanolic extract of areca nut seeds contains condensed tannins, hydrolyzed tannins, flavans and phenolic compounds, gallic acid, gum, lignin, evaporated and non-volatile oils, and salts (Meiyanto et al., 2008). According to (Rairisti A et al., 2014), areca nuts are primarily composed of polyphenols (20%) such as tannins and flavonoids. Other components include alkaloids, lipids (14%), saponins, steroids (cryptogenin and β -sitosterol), and the amino acid choline. Flavonoids are natural phenolic chemicals with antioxidant properties and medicinal action. Flavonoids in the human body work as antioxidants, making them effective cancer prevention agents. According to (Meiyanto et al., 2008), the antioxidant activity found in an ethanolic extract of areca nut is favorably connected with cancer prevention and does not cause chromosomal abnormalities. Flavonoids have several benefits, including cell structure protection, increased vitamin C effectiveness, anti-inflammatory, bone loss prevention, and antibacterial activity.

Exposure of arecoline (areca nut) has been shown to harm different mammalian cells, enhance mitochondrial membrane potential hyperpolarization, and promote DNA fragmentation (Lo et al.,

2008). Arecoline alters gonad morphofunction in male mice, causes spermatozoa abnormalities in sheep, inhibits DNA synthesis in germ cells and other human cells, and inhibits spermatogenesis in male chickens (Susila, 2013). In addition, Kiong-Er et al discovered that arecoline induction in vitro reduced spermatozoa motility (Akmal et al., 2018).

In line with other research in population scientific journals on the antifertility effect of the water fraction of areca nut seeds (*Areca catechu*) as an apoptosis agent in *Rattus norvegicus* testicular tissue cells, exposure to areca seed extract has been shown to affect rat spermatozoa motility (Akmal, 2016).

The results of statistical tests using Chi-Square show that there is no correlation between the wife's habit of consuming areca nut and the number of children. However, the husband's and both habits show a p -value of <0.05 , indicating a correlation between the husband's habit and both reproductive-age couples in consuming areca nuts. The number of children was significantly associated with the husband's behaviors ($0.000 < 0.05$) and the both habits ($0.031 < 0.05$). We believe that husbands who consume areca nuts on a regular basis will have an impact on sperm quality. This can affect fertility and lead to fewer number of children born.

4. Conclusion

Based on the results of statistical tests that have been carried out using Chi-Square where the p -value was <0.05 , we found that there is a correlation between the habit of consuming areca nuts and the number of children in reproductive-age couples in the Public Health Center of East Sorong Work Region.

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