HOUSEHOLD AND CHILD FEEDING PRACTICE FACTORS AFFECTING STUNTING STATUS AMONG RAGLAI CHILDREN UNDER FIVE IN KHANH HOA PROVINCE, VIETNAM

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ABSTRACT

Little is known about ethnic minorities in Vietnam, and few studies have been conducted on nutrition among these populations. Ethnic minorities living in mountainous areas like the Raglai have low socioeconomic status, which is strongly related to poor nutrition. Data from the National Institute of Nutrition of Vietnam shows that all ten provinces with the highest stunting prevalence are located in mountainous regions, which often get no attention or support from the government. The objectives of this study were: 1) to explore the stunting prevalence among Raglai children in Khanh Hoa province, Vietnam; 2) to identify the association between stunting status of Raglai children and factors relating to household conditions and child feeding practices in Khanh Hoa province, Vietnam.

This research was a cross-sectional non-experimental study. It used secondary data from an Anthropometric and nutritional combined research of Ethnic Minority Raglai People in the two mountainous districts of Khanh Hoa province. Data from 0-4 age group (under-five) was taken from the original study (under-50), which used a two-stage cluster and systematic random sampling. The sample was 1,365 after dropping out implausible values. Descriptive analysis was used to illustrate the mean and percentage distributions. Bivariate analysis and multivariate analysis with odds ratio were used to examine the relationship between the outcome variable and the selected factors.

Findings indicated that 1) there was a very high stunting prevalence among Raglai children in Khanh Hoa province, that two-thirds of children were stunted in 2013; 2) residential area, age, gender and weight at birth of the children were found to be significantly related to child stunting. Girls were twice as likely to be stunted as boys; 3) most of the household factors were found to be statistically associated with stunted growth. The mother's educational attainment was considered the most important factor, since it represents the well-being of a community, which strongly affects the nutritional status; 4) among child feeding practice factors, only duration of breastfeeding was found significantly associated with stunting in bivariate analysis.

KEY WORDS: ETHNIC MINORITY/ RAGLAI/ MOUNTAINOUS/ STUNTING/ UNDER-FIVE CHILDREN/ HOUSEHOLD/ CHILD FEEDING PRACTICE

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UNICEF	United Nations Children's Fund
WHO	World Health Organization

CHAPTER I
INTRODUCTION

1.1 Rationales of the Study

Nowadays, the world still has to cope with the multiple burdens from malnutrition. Many people are suffering from the consequences of stunted growth, micronutrient deficiencies, overweight/obesity, and related non-communicable diseases (Road to Rio Global Nutrition Advocacy Working Group, 2013). However, while there have been many studies about malnutrition in general and stunting in particular, not many have examined high-risk groups, such as ethnic minorities, who are vulnerable and forgotten by the society. Many ethnic groups live in mountainous areas and these groups, wherever they are located, have the same characteristics of low socioeconomic status and low educational level. Stunting prevalence among under-five children in those areas is high reflecting poor nutrition resulting from poverty (Hoffman & Klein, 2012; Rawe et al., 2012). For many families, the unavailability of nutritious food is not the reason why their children become malnourished or stunted; they cannot afford to buy it even if they spent all of their income for food. Furthermore, caretakers of young children, who are mostly the mothers, have low educational levels and do not know how to feed their children properly, thus negatively affecting child nutritional status. Besides, low birthweight, which is a powerful predictor of stunting, indicates that a child's mother may be malnourished due to their low status in the community and the family (Rawe et al., 2012).

The prevalence of poverty among ethnic minorities in Vietnam has been well documented. A study in 2012 shows the positive situation of poverty among ethnic minorities despite the unequal accessibility to land, education, credit and other services. Nearly half of ethnic minorities are not poor and 34% of the ethnic people have escaped poverty since 1993 (Wells-Dang, 2012). However, it is evident across the studies that Raglai people in Khanh Hoa province still live with very low socioeconomic status and educational level (Le, 2001; Sakaya & Shine, 2011). Studies

about Raglai communities in Vietnam are very limited so it is difficult to identify the well-being and the behaviors of the Raglai people recently. In a study about child malnutrition in Khanh Son district in 2001, the poverty proportion was about 60.6% of total households in 2000 and the Kinh people, who account for 87% of Vietnam's population, had better economic conditions than the Raglai. Thus malnutrition, especially among children, became an emerged major health problem in Khanh Son (Le, 2001). Despite the improved situation among ethnic minorities in Vietnam since 1993, there are huge gaps in socioeconomic status between the Raglai and Kinh people. Since Raglai people are the majority population of these two mountainous districts, the low socioeconomic status among Raglai people has been a burden for the whole areas in which they live. Poverty also negatively affects child malnutrition and health, which should be addressed with urgency in provincial health care plans for these regions (Le, 2001).

Another main objective of this study, besides contributing to the understanding of the stunting problem nation-wide and throughout the world, is to provide more information about the little-known Raglai community. This includes an improved understanding not only of nutrition but also the socioeconomic conditions in these regions. This can help to keep the Raglai community above the poverty line and protect children from malnutrition: "*efforts to accelerate significantly economic development will be unsuccessful until optimal child growth and development are ensured for the majority*" (De Onis, Monteiro, Akré, & Clugston, 1993, p. 703; Rawe et al., 2012).

Data from National Institute of Nutrition of Vietnam also shows that all ten provinces with the highest stunting prevalence are located in mountainous regions, which often get a lack of attention or support from the government (National Institute of Nutrition). Raglai people in Khanh Hoa province mostly live in Khanh Son and Khanh Vinh districts, which also are highland areas. Likewise, similarly with the other mountainous regions, they receive poor treatment from the society. A report from Khanh Hoa Department of Health indicates that there are 38.8% and 34.0% of under-five children who are stunted in Khanh Son and Khanh Vinh districts respectively (Khanh Hoa Department of Health, 2015). However, the stunting prevalence among Raglai children is three times higher than the rate among Kinh children (Vietnamese

majority ethnic group) in these areas (Khanh Hoa Department of Health, 2015). This can be explained by the fact that there is a high prevalence of stunting among the Raglai children in Khanh Son and Khanh Vinh district. The figures show that nutrition is poor for the whole population and there exists a serious poverty in those areas, which should raise more concern by the government.

Children are the future generation who will shape the world. Regardless of their ethnicity or race, all children should have optimal nutrition, which helps them to reach their full physical and mental potential (Alive & Thrive, Vietnam Ministry of Health, & UNICEF, 2012). Comparing with the expected value (5%) of stunting prevalence among children nowadays, it is unacceptable that there are more than 160 million under-five children who are suffering from stunted growth (lack of height for their age) (Lewit & Kerrebrock, 1997; Road to Rio Global Nutrition Advocacy Working Group, 2013; UNICEF, WHO, & The World Bank, 2014; United Nations, 2014). Among under-5 children, there is a ratio of one in four children being stunted worldwide and one in three in the developing world (Rawe et al., 2012; UNICEF, 2015). Despite a significant reduction from 40% since 1990, the stunting prevalence remains a slow decrease of 0.6% per year in the last 20 years (Rawe et al., 2012; United Nations, 2014). Asia and Africa were the areas of most concern where most of the children (more than 90%) who are stunted among developing world live (UNICEF, 2009). One-thirds of the children who suffer stunted growth live in Africa and approximately half of all stunted children live in Asia in 2013 (UNICEF, WHO & The World Bank, 2014).

Stunting is considered to be an indicator reflecting greater malnutrition problems than the other indicators (UNICEF, 2009). In most countries, stunting is more prevalent than wasting and underweight, and in some countries, stunting affects more than half of under-5 children (Dewey & Begum, 2010; UNICEF, 2009). Figure 1.1 shows that even with the same trend, there is always a huge gap between the rates of stunting and the second highest prevalent indicator, underweight. However, contrary to underweight or wasting, stunting is unrecognized by most societies where short height is common and its long-term effects are not widely noticeable (Alive & Thrive et al., 2012; Dewey & Begum, 2010; Rawe et al., 2012). Many health workers

and policymakers do not pay enough attention to make stunting and its consequences become a public health issue (Dewey & Begum, 2010).

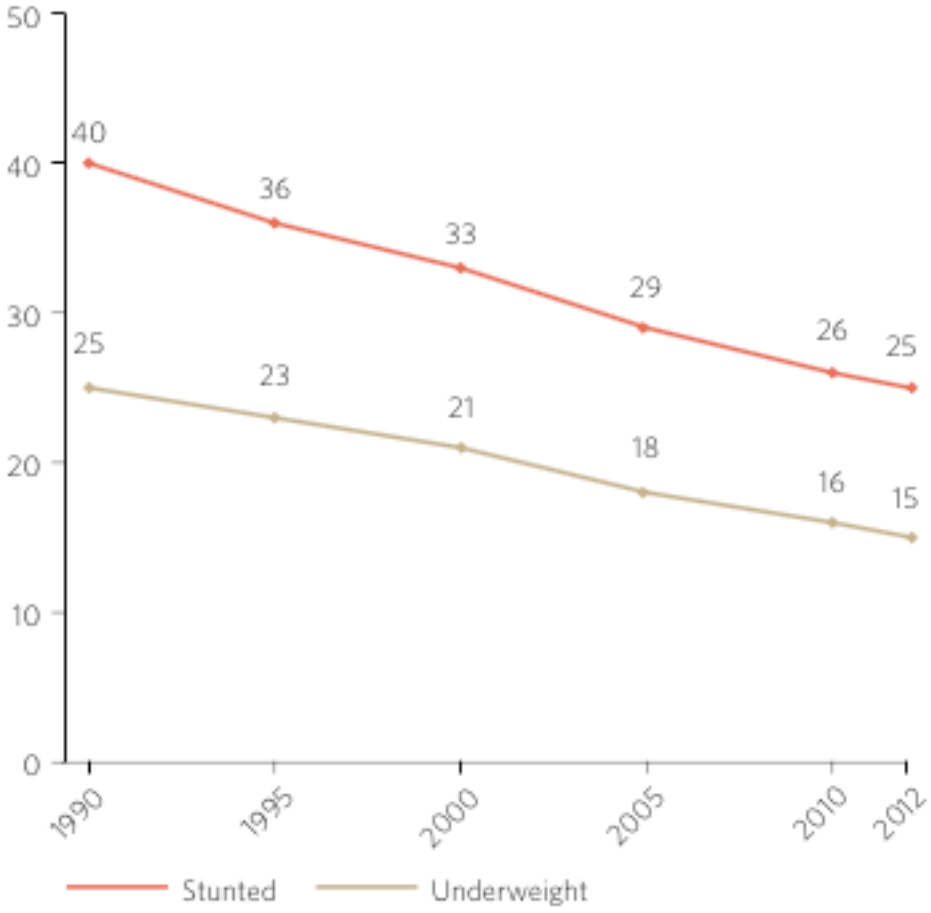

Figure 1.1 Proportion of children under age five moderately or severely stunted, and moderately or severely underweight, world-wide trend from 1990 to 2012 (Percentage)

Source: Taken from The Millennium Development Goals Report 2014, p. 14 (United Nations, 2014)

Compared to other measurements, stunting reflects illness and nutritional deficiencies more accurately, which occur during the most critical developmental period (UNICEF, 2009). It is more considerable that the critical period, which is considered as a window to prevent stunting, is very short (Bloem, 2013). Children's growth is not a constant process. This progress occurs strongly and makes the children grow quickly at specific moments in the first two years of life. Therefore, inadequate

nutrition consumption during this developmental period may lead stunted children to limited growth in later life (Hoffman & Klein, 2012). Besides, avoiding stunting needs a sensitive dietary and being stunted is often related to micronutrient deficiencies, because food with essential nutrients for height gain also contains decent sources of other micronutrients (Bloem, 2013; Dewey & Begum, 2010).

1.2 Background of the Study

Malnutrition is considered to be directly or indirectly associated with mortality and disability throughout the world (WHO, 2013b). There should be more concern about the fact that one third of all child deaths are caused by malnutrition but it is seldom put into the list of child mortality's direct causes (Bain et al., 2014).

Undernutrition is the single leading cause of mortality among under-five children; it is also involved in about half of all child deaths (Howlader et al., 2012; Road to Rio Global Nutrition Advocacy Working Group, 2013). Though malnutrition prevalence gets attention worldwide, ending malnutrition is still an unfinished mission (Road to Rio Global Nutrition Advocacy Working Group, 2013). Malnutrition is currently confronting the developing world. A study in 2003 estimates that by excluding malnutrition alone, developing countries can be free from 32% of burden of disease globally (Howlader et al., 2012). Besides, there is rapid rise of overweight and obesity worldwide, particularly in lower- and middle-income countries (Road to Rio Global Nutrition Advocacy Working Group, 2013).

Nutritional status of children is a measurement of their survival and growth in early ages (Zottarelli, Sunil, & Rajaram, 2007). There are physical and mental effects from malnutrition; some lead to short-term effects while others lead to lifetime effects or mortality among children. Insufficient nutritional intake as well as morbidity is related to the causes of malnutrition while maternal and child health care, environment and others are indirect factors (WHO, 2013b). Some results from malnutrition are increasing the vulnerability of children to common infections, putting them into a more severe infectious condition and delaying recovery (Alive & Thrive et al., 2012; Stillwaggon, 2008; UNICEF, 2015). Malnutrition also increases the chance

of HIV transmission from mother to child. Moderate malnutrition affects every component of the immune system (Stillwaggon, 2008).

Lack of nutrition in the first 1,000 days can lead a child to have stunted growth, which may affect them through their adult life. A child who is stunted may be faced with several problems associated with delayed development, impaired cognitive ability and learning and work performance deficiency (Howlader et al., 2012; UNICEF, 2015). Undernourished children learn some developmental milestones such as sitting, walking, and talking later than those who are well nourished. Early childhood malnutrition affects their activity levels, attention and functional test results negatively (Howlader et al., 2012). Further, early malnutrition of children affects physical and cognitive retardation, which lasts until their adult life. Adults who had a history of early malnutrition are more likely to have chronic diseases and disability. The unproductive life of people who suffer from malnutrition causes an economic burden of the society (Zottarelli et al., 2007).

There are more than 160 million under-five children being estimated to have stunted growth (reduced height for age), at least 51 million children are wasted (too low weight for height) and 42 million children are overweight (too heavy for one's age) (Road to Rio Global Nutrition Advocacy Working Group, 2013; UNICEF, WHO & The World Bank, 2014; United Nations System & Standing Committee on Nutrition, 2014). According to a statistical report in 2011, compared with other regions Asia holds the highest percentage of under-5 children who are underweight or wasted (21.9% and 11.2% respectively) (Chaparro, Oot, & Sethuraman, 2014). The same report also leads to the conclusion that Asia has the largest total number of under-5 children who suffer from stunted growth, wasting, or underweight. Southeast Asia, compared with all subregions in Asia, has the second largest total proportion of children who are stunted (29.4%), wasted (9.4%) and underweight (18.3%) (Chaparro et al., 2014). The malnutrition problem in this region has been seen as an obstacle to the world's ability to achieve most of the Millennium Development Goal (MDG) 2050 targets for nutrition (Chaparro et al., 2014; UNICEF, 2009).

Among 20 countries that have the highest prevalence of malnutrition worldwide, there are four Southeast Asian countries including Vietnam joining the group. Though Vietnam has had successful control over the malnutrition problem

(Chaparro et al., 2014), there is a huge gap in malnutrition prevalence between majority population and ethnic minorities, especially with regard to underweight and stunting status. The 2011 statistics from Vietnam's General Statistics Office show that underweight prevalence of Vietnamese children who are from ethnic minorities is double the rate of underweight children who are from the majority population (General Statistics Office of Vietnam, 2011). Approximately one-fourth (22.7%) of children are underweight. Stunting status among children is even more considerable with 41% of children having stunted growth. This is doubled the stunting prevalence among children who belong to the majority population (General Statistics Office of Vietnam, 2011).

1.3 Research Questions

1) What is the stunting prevalence among Raglai children in Khanh Hoa province, Vietnam?

2) What are the determinants affecting stunting status among Raglai children in Khanh Hoa province, Vietnam?

1.4 Research Objectives

1) To explore the stunting prevalence among Raglai children in Khanh Hoa province, Vietnam.

2) To identify the association between stunting status of Raglai children and factors relating to household condition and child feeding practice in Khanh Hoa province, Vietnam.

CHAPTER II
LITERATURE REVIEW

2.1 Definitions of Malnutrition and Undernutrition

'Malnutrition' and 'Undernutrition' are two terms commonly used in nutrition articles when discussing nutritional status. However, these terms "*are often used loosely and interchangeably*" (Shetty, 2003, p. 18), and sometimes, without mentioning about their definitions clearly (Shetty, 2003). So what are Malnutrition and Undernutrition?

In his study, Shetty (2003) briefly refers Malnutrition to "*all deviations from adequate and optimal nutritional status, including energy undernutrition and over-nutrition (obesity is a form of malnutrition)*" (p. 18) while Undernutrition is referred to "*generally poor nutritional status, but also implies underfeeding*" (p. 18). Later on, also in the same study, he demonstrates these terms more specifically that malnutrition occurs from *"deficiencies of specific nutrients or from diets based on inappropriate combinations or proportions of foods*" and it can also "*results from excess nutrient losses or utilization*" (Shetty, 2003, p. 18). When he describes undernutrition as a outcome "*caused primarily by an inadequate intake of dietary energy, regardless of whether any other specific nutrient is a limiting factor*" (Shetty, 2003, p. 18).

Meanwhile, Grebmer, et al. (2014) state basically the same main ideas with Shetty's study about Malnutrition and Undernutrition but define them in a different way which is more detailed and understandable for non-academic readers. He and co-authors also explain Malnutrition as a broader term including both undernutrition which is "*problems of deficiencies*" and overnutrition - described as "*problems of unbalanced diets*", which is probably "*consuming too many calories in relation to requirements with or without low intake of micronutrient-rich foods*" (Grebmer et al., 2014, p. 7). While in another statement, Undernutrition is specified that "*goes beyond calories and signifies deficiencies in any or all of the following:*

energy, protein, or essential vitamins and minerals" and is the consequence of either "*inadequate intake of food*", "*poor utilization of nutrients*" or a combination of both (Grebmer et al., 2014, p. 7).

According to their own definition about Malnutrition, UNICEF tries to emphasize that "*Malnutrition - the state of being poorly nourished - is not merely a result of too little food but of a combination of factors: insufficient protein, energy and micronutrients, frequent infections or disease, poor care and feeding practices, inadequate health services and unsafe water and sanitation*" (UNICEF). Joining with Grebmer et al., UNICEF also states that individual's nutritional status is caused by a range of factors which are grouped to three general categories: "*food, care and health*" and "*adequate nutrition requires the presence of all three*" (Grebmer et al., 2014; UNICEF, 2009, p. 13).

2.2 Stunting and other Nutritional Status Measurements for Children Under-5

The nutritional status of children are based on weight and height measurements and regularly refer to three indicators which are weight for age, height for age and weight for height (Food and Agriculture Organization of the United Nations, 1996; Haen, Klasen, & Qaim, 2011). These indicators are used for determining whether the child is weight deficiency, stunting, wasting and obesity in order to explore the histories of nutritional insult to the child, current state of nutritional status, or the prevalence of each phenomenon (Bloss, Wainaina, & Bailey, 2004; Food and Agriculture Organization of the United Nations, 1996).

Stunting, which is poor height for one's age, is an indicator of chronic undernutrition caused by lack of nutrients intake over a long period which begins from the conception of the child to the first 24 months, or in another term, first 1000 days of life (Bloem, 2013; Bloem et al., 2013; Hoffman & Klein, 2012; Mendez & Adair, 1999; Rawe et al., 2012; United Nations System & Standing Committee on Nutrition, 2014). Rawe, et al. (2012) explain that stunting happens to a child when his body "adapts to a long-term lack of nutrients by giving priority to the needs of vital organs and functions rather than to growth in height" (Rawe et al., 2012, p. 2). Consequences

from stunting affect stunted children until their adult life resulting poor development, especially in cognition (UNICEF, 2015). The damage done from stunted childhood is largely irreversible even if the child has improved diets and is resolved from any health problems later on (Rawe et al., 2012).

Inversely with stunting, wasting - too thin for one's height - is an indicator of acute undernutrition, which is associated with food shortages and typically, caused by insufficient food intake or incidence of infectious diseases (Haen et al., 2011; USAID & FANTA III, 2011; WHO, 2010). Results from wasting can refer to deteriorating the immune system, leading to severity and duration of and susceptibility to infectious disease and increasing risk of mortality (WHO, 2010). Underweight - poor weight for one's age - is a composite form of undernutrition, which indicates features of wasting, stunting or both (Badham & Sweet, 2010; WHO, 2010). Therefore, using determinants and interpretation of both wasting and stunting to describe underweight - as a both acute and chronic undernutrition - is more useful since underweight is difficult to specify (Badham & Sweet, 2010; USAID & FANTA III, 2011). This is the indicator for which most data have been collected in the past because weight is easy to measure (WHO, 2010). In the other side, overweight, which is not in the undernutrition category, is an indicator associated with higher chance being obese in adulthood, which can lead to be affected by diabetes and cardiovascular diseases (WHO, 2010).

These indicator are determined by converting the height and weight measurements into standard deviation (SD) scores (Z-scores), which are calculated by "*dividing the difference between the age-and sex-specific anthropometric indicator of an individual child and the median of the same indicator from a reference population by the standard deviation of that indicator in the reference population*" (Food and Agriculture Organization of the United Nations, 1996; Haen et al., 2011, p. 13).

Data for measuring these anthropometric indicators are often consentaneous aggregated for children aged 0 to 5 (Food and Agriculture Organization of the United Nations, 1996; Haen et al., 2011). The Z-score measures the interval between the anthropometric status of a particular child and the median of the reference population (Haen et al., 2011). The interval between -2 SD and +2 SD from the mean (=0) is considers as "normal" on the normalized distribution for the three indices

(Food and Agriculture Organization of the United Nations, 1996). Table 2.1 shows the measurements, ranges and interpretation of standard deviation scores of each indicator to define the malnutrition status of under-5 children. Moderate undernutrition is indicated to a child when z-score value is less than -2 while less than -3 reflect severe undernutrition (Haen et al., 2011).

Table 2.1 Anthropometric measurements

Indicator	Measure	Moderate	Severe
Stunting	Height/Length for Age (H/A)	< -2 and ≥ -3 z-score	< -3 z-score
Wasting	Weight for Age (W/A)	< -2 and ≥ -3 z-score	< -3 z-score
Underweight	Weight for Height (W/H)	< -2 and ≥ -3 z-score	< -3 z-score
Overweight	Weight for Age (W/A)	> +2 and ≤ +3 z-score	> +3 z-score (obese)

Source: USAID, Anthropometric: Children under 5, 2011 (Badham & Sweet, 2010; USAID & FANTA III, 2011)

There is one important difference between measuring stunting and other indicators that length is used for anthropometric measuring for the recumbent children aged less than 24 months (two years). After 24 months, height of the standing children is measured to determine their growth (Lewit & Kerrebrock, 1997; USAID & FANTA III, 2011).

The calculation of Z-score critically depends on the reference standard (Haen et al., 2011). The previous WHO reference standard seen as problematic was replaced in 2006 by a new standard which is based on the growth and weight development in six countries - Brazil, Oman, Ghana, India, USA, and Norway (Haen et al., 2011). The new WHO standard is "*explicitly constructed as a 'normative' standard of 'optimal' child growth and weight development*" and creates a single new growth standard due to the similarity of the weight and height charts of the children in the six countries (Haen et al., 2011, p. 14). WHO has calculated the cut-off values for levels of public health significance for undernutrition measurements included in Table 2.2 (Haen et al., 2011).

Table 2.2 Stunting prevalence cut-off values

Indicator	Prevalence cut-off values for public health significance
Underweight	< 10%: Low prevalence 10-19%: Medium prevalence 20-29%: High prevalence ≥ 30%: Very high prevalence
Stunting	< 20%: Low prevalence 20-29%: Medium prevalence 30-39%: High prevalence ≥ 40%: Very high prevalence
Wasting	< 5%: Acceptable 5-9%: Poor 10-14%: Serious ≥ 15%: Critical

Source: WHO, Nutrition Landscape Information System, 2010 (WHO, 2010)

2.3 Stunting Prevalence

In 2013, one in four under-5 children were stunted globally. General trends are seen positive. The world stunting prevalence had reduced from 33% to 25%, and the number of stunted children had declined from 199 million to 161 million from 2000 to 2013 (UNICEF, 2015). Asia and Africa are the continents having the highest stunting rate among under-5 children (Figure 2.1). In 2013, about half of all stunted children lived in Asia and one third lived in Africa (UNICEF, 2015).

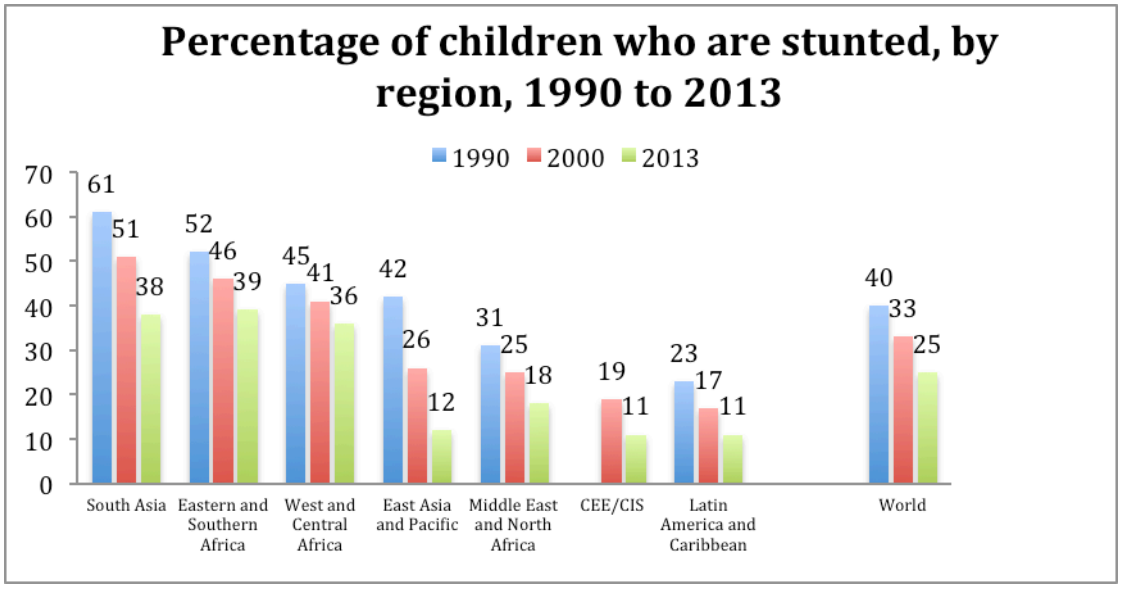

Figure 2.1 Percentage of children under 5 who are stunted by region, 1990 to 2013
Source: UNICEF, Current status & progress of Malnutrition, 2015 (UNICEF, 2015)

Figure 2.2 shows the stunting prevalence among Southeast Asian countries with the same trends. Though it is believed that the stunting prevalence in most countries was much higher 20 to 25 years ago, the statistics from the figure do not show any significant reduce of stunting rate (Bloem et al., 2013). Instead, it shows the stunting level and the huge gaps among the countries. According to a statistics report of the most recent period (2006-2010), Laos has the highest stunting rate, which is 48% while the prevalence is only 4% in Singapore (Bloem et al., 2013). Thailand and Malaysia have their stunting prevalence below 20% when Vietnam and four other countries (Cambodia, Indonesia, Myanmar and Philippines) are put in the high-prevalence group (30%-40%).

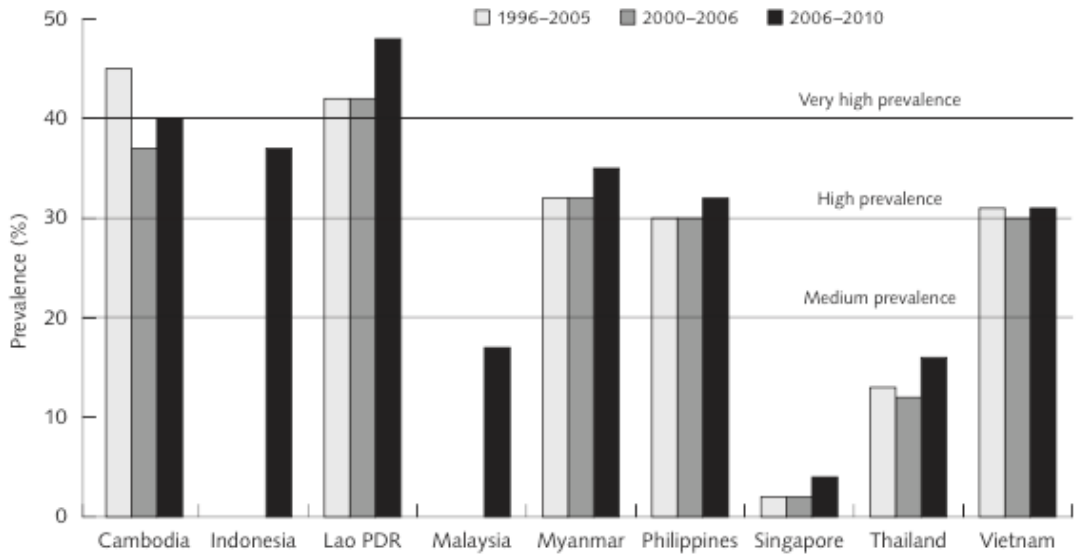

Figure 2.2 Changes in stunting prevalence between 1996 and 2010 in Southeast Asian countries with cutoffs indicating public health problem

Source: Taken from Key strategies to further reduce stunting in Southeast Asia: Lessons from the ASEAN countries workshop, p. S9 (Bloem et al., 2013)

Two and a half million children are stunted (30%) ranking Vietnam as 13th among all the countries having highest stunting prevalence (Alive & Thrive et al., 2012). Due to the effective interventions, Vietnam has been successfully reducing stunting prevalence for recent years. However, one in five children were still impacted by stunted growth throughout the country (Chaparro et al., 2014). Besides, the pattern was not similar which was very high among the children of the ethnic minorities. The stunted children among these ethnic groups took a proportion of 41% in 2011 (Chaparro et al., 2014).

According to the latest statistical report of malnutrition prevalence from the National Institute of Nutrition, stunting rate in Vietnam exposes the similar patterns with the world prevalence (National Institute of Nutrition, 2015). It can be seen from Figure 2.3, between two highest prevalent indicators, there are same trends. Nevertheless, while the underweight and stunting rates were alike in 1999 (37% & 39% respectively) and have kept reducing over years until now, the changes have been not the same. The recent stunting prevalence is almost doubled the underweight rate with 25% for the former and 14% for the latter in 2014.

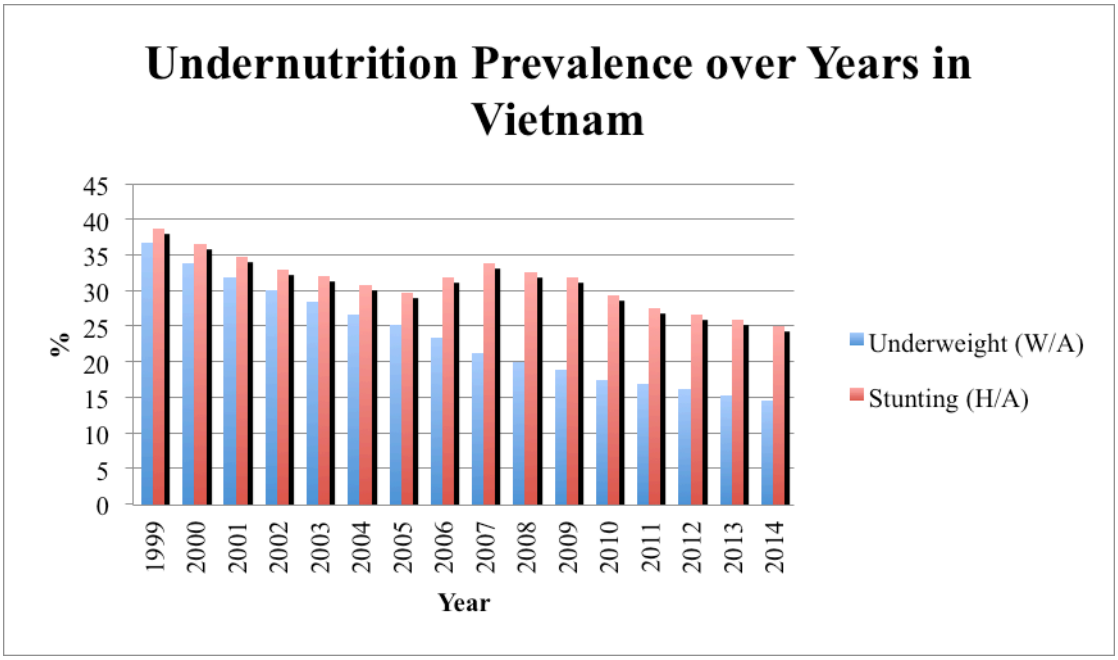

Figure 2.3 Statistics of undernutrition prevalence among children over years in Vietnam

Source: Vietnam National Institute of Nutrition, Undernutrition statistics, 2015 (National Institute of Nutrition, 2015)

2.4 Consequences of Stunting

"When a child is stunted, it means that essential physical and mental growth processes are being compromised" (Alive & Thrive et al., 2012). Stunting which is a hindrance of the human physical and mental development is concerned as the main nutrition problem (Alive & Thrive et al., 2012; Bloem, 2013). Morbidity, especially higher risk of getting chronic diseases, and development obstruction are the most considered consequences of stunted growth (African Union Commission, 2013; Alive & Thrive et al., 2012; Bloem, 2013; Dewey & Begum, 2010). Poor cognitive development, early mortality and exposure of infectious disease due to immune system deficiency are listed as the short-term effect of child's stunting (WHO, 2013a). While reduction in adult stature, higher risk of chronic disease exposure, poor school and work performance, and negative reproductive outcome reflect long-term effects of

stunting (Badham & Sweet, 2010; Bloem, 2013; Dewey & Begum, 2010; WHO, 2013a).

Stunted children are averted by stunting from attaining their intellectual and physical potential, which lead to their adverse school and career outcome (African Union Commission, 2013; Alive & Thrive et al., 2012; Bloem, 2013; Lewit & Kerrebrock, 1997). There are several studies have proved the association between stunting status and school performance. The studies found that linear growth leads to better-attained schooling such as increased grade attainment, and higher results on reading comprehension and nonverbal cognitive tests (Haddad, Cameron, & Barnett, 2014). Besides, it is evident that once children gain their height by one centimeter, they are more likely to have salary increase of 8 to 10 percent in adulthood (African Union Commission, 2013). However, not only individuals suffer stunting, the society to which they belong is also affected, especially the economic development (Bloem, 2013). There is an estimation of a nation's gross domestic product is increased 2 to 3 percent by investing in infant and young children (Alive & Thrive et al., 2012).

Higher risk of getting obesity, diabetes and other chronic illness are also related with early stunting (Bloem, 2013). The results from the development of chronic conditions such as cardiovascular diseases and diabetes refer to the children who are underweight and stunted in the first two years, and then gain weight rapidly in childhood and adult life (Badham & Sweet, 2010). Moreover, being stunted in very early babyhood may affect the children to get more risk to have severe stunting than those who are stunted afterwards (Mendez & Adair, 1999).

Reproductive issues are also scientifically proved to be long-term related to stunting (Figure 2.4). According to data from Demographic and Health Surveys (DHS) conducted during 1999 and 2008, children aged under five had 40% higher risk of mortality (after adjusting for multiple factors) if they were born to the mother whose height was below 145 cm (Dewey & Begum, 2010). The mothers with historical stunted growth have a smaller pelvis; thus suffer difficulties during childbirth with a high maternal and child mortality rate (Bloem, 2013). In a study in Nigeria (2010), 53% of perinatal mortality is caused by obstructed labor (Dewey & Begum, 2010). Infants who are born to the mother with height shorter than 145 cm are more likely to have birth asphyxia, which largely results perinatal mortality from

obstructed labor (Dewey & Begum, 2010). Also, chronically undernourished women have higher mortality exposure and higher chance to deliver a small baby causing a repetitive poor nutrition cycle over generations (as shown in Figure 2.5) (Alive & Thrive et al., 2012; Dewey & Begum, 2010; Rawe et al., 2012; UNICEF, 2009).

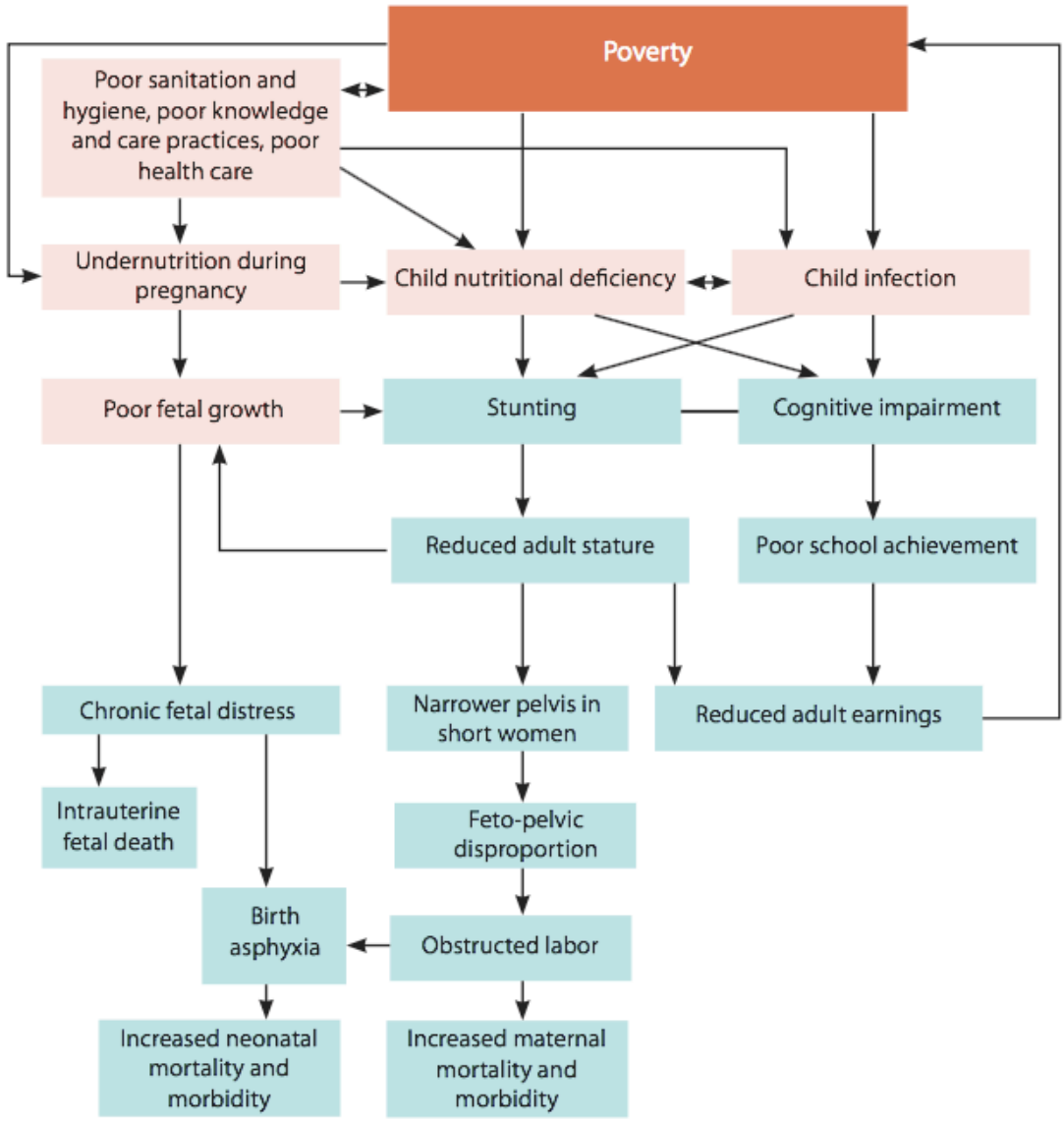

Figure 2.4 Potential causal pathways for long-term consequences of stunting
Source: Taken from Why stunting matter, 2010, p.4 (Dewey & Begum, 2010)

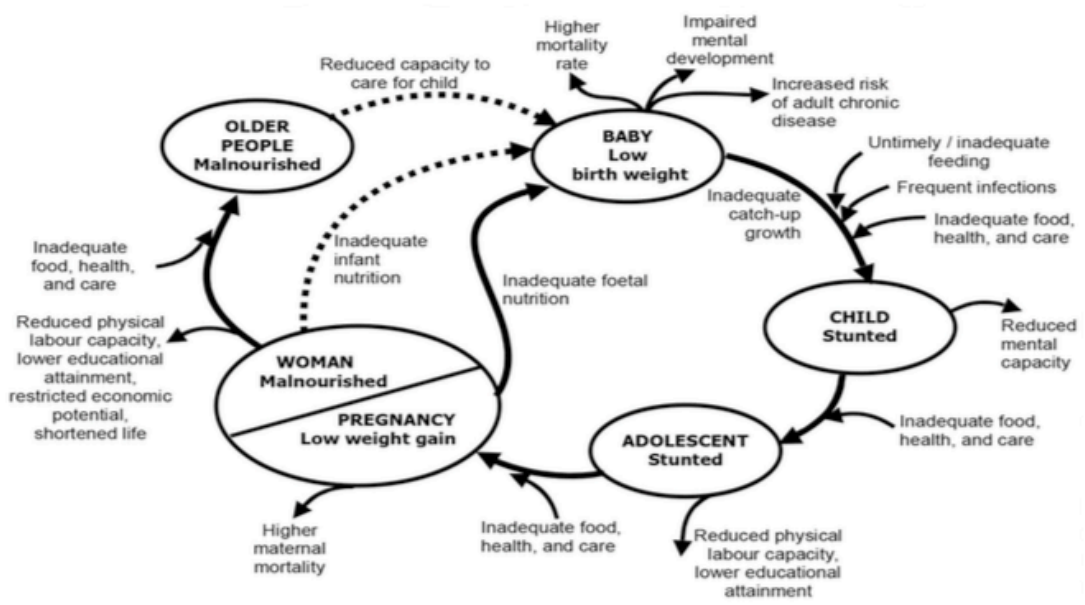

Figure 2.5 Life cycle of Malnutrition

Source: Estimates of Benefits and Costs of a Comprehensive Program for Nutrition in Bangladesh, 2012, p.16 (Howlader et al., 2012)

2.5 Factors Affecting Stunting

There are numerous causes, which are genetic and environmental factors, affecting stunting during the child's development period (Badham & Sweet, 2010). Inadequate nutrition intake and illness, such as infection, are the immediate causes affecting not only stunting alone but also all types of undernutrition (Alive & Thrive et al., 2012; Grebmer et al., 2014; Rawe et al., 2012). Infection, either chronic or recurrent infection, or in combination with intestinal parasites contribute to retarded growth (Lewit & Kerrebrock, 1997). A study in Ecuador (2003) shows that children with Giardia infection - an intestinal parasite related to unsafe water and causing diarrhea - were two times more likely to be stunted than the others (Kent et al., 1988; Sackey, Weigel, & Armijos, 2003).

For the most vulnerable period of a child's development, adequate nutrition, which provides the right amount of carbohydrates, protein, essential fatty acids, vitamins and minerals, is essential (Badham & Sweet, 2010). Breastfeeding, especially exclusive breastfeeding, and complementary feeding are the keys nutritional

health messages for any mother. It is suggested that exclusive breastfeeding should last up to first six months of a child's life, then continue breastfeeding together with the proper complementary feeding for at least the first two years of the child's life (Badham & Sweet, 2010). "*Breastmilk is the perfect food, it contains all the nutrients and micronutrients an infant needs for normal growth during the first six months of life*" (UNICEF). A baby with breastfeeding is protected from gastrointestinal tracts, infections and diarrhoeal diseases, which are related to stunted growth (UNICEF, 2009). There are various studies, which show the association between breastfeeding and children's stunting status. In his study, Borja (2013) shows the association between breastfeeding and lower risk of stunting, especially in the first 12 months of the children (Borja, 2013). Hien and Hoa (2009) also found that children with duration of exclusive breastfeeding lower than six months are 3.6 times more likely to be stunted than those breastfed exclusively for six or more than six months in Nghean, Vietnam (Hien & Hoa, 2009). Besides, a study in South Ethiopia (2014) also shows not only the negative effect of stunting status toward short duration of exclusive breastfeeding (<6 months) but also indicate that children whose breastfeeding duration was less than two years were more likely to have stunted growth than those who breast fed for two or more than two years (Fikadu, Assegid, & Dube, 2014).

Underlying causes, which influence the immediate causes, are related to hygiene, sanitation, gender, mother's education, and poverty (Alive & Thrive et al., 2012; Badham & Sweet, 2010). Unsafe water, poor sanitation and hygiene can increase the risk from getting diarrhoea and other illness, which can lead to stunting and higher risk of mortality (UNICEF, 2009). A study, which conducted data from 29 developing countries in 1994, shows the association between source of water and sanitation facilities, and stunting. The results illustrate that the children from households with piped drinking water are less likely to be stunted than those whose households use water from public tap or well, and surface water (Sommerfelt & Stewart, 1994). In the same study, the authors also show that the children whose mothers reported no toilet facility are most likely to be stunted than those whose families have latrine and flush toilet (Sommerfelt & Stewart, 1994).

Maternal education has shown to be important for child health, nutrition and survival (Ajao, Ojofeitimi, Adebayo, Fatusi, & Afolabi, 2011). Educated mothers

are more concerned about nutrition, hygiene and health care (Ajao et al., 2011). Ajao et al. (2011) found the association between maternal education and stunting. Children who were born to mothers with no formal education were four times more likely to be stunted than those born to mother who had completed more than primary education in Nigeria (Ajao et al., 2011).

In South Ethiopia study, Fikadu et al. (2014) also show that children whose mothers are merchants and farmers were more likely to suffer stunted growth than those whose mothers are housewives (Fikadu et al., 2014). The authors explain that because the mother's contact time with the child is decreased so there is exposure of short duration of exclusive breastfeeding, early cessation of breastfeeding, bottle-feeding and improper complementary food, which greatly affect stunted growth in children (Fikadu et al., 2014).

It is explained that birth order is related to child nutrition due to strain on family resources. The number of total children is also considered to be important due to its influence to availability of family resources and parents' attention. Susan Horton found that later-born children are significantly worse nourished and later concluded because of strains on household's resources. Theoretically, later-born children could be allocated financial resources intertemporally to offset the disadvantages. However, it is believed that this theory does not reflect what really happen in the developing countries and low-income households, and the results somehow proved that (Horton, 1988). Besides, a study in Nghean, Vietnam (2009) show that children whose mother has three or more than three children are 2.5 times more likely to be stunted (Hien & Hoa, 2009).

Infants who are born to short mothers have greater exposure of low birth weight. Low birth weight or those with slow development infants are more likely to be smaller during adulthood than those not born with a low birth weight (Alive & Thrive et al., 2012; WHO, 2010). In her study, Hien et al. (2009) suggests that low birth weight (< 2,500 gram) is the most consistent risk factor for malnutrition. Children aged under three whose their birth weight is < 2,500 gram are 4.4 times more likely to have retarded growth than those whose weight is ≥ 2,500 gram (Hien & Hoa, 2009).

Vitamin A deficiency (VAD) is believed that it is a common cause of blindness and of increased severity of infectious diseases, which refer to the

immediate cause of malnutrition (Caulfield, Richard, Rivera, Musgrove, & Black, 2006; Rawe et al., 2012; Stillwaggon, 2008). Though it is very hard to define the relationship between Vitamin A deficiency and child growth, and has not been conclusively proven in previous experiments, there have been some studies, which show the links of VAD and stunted growth (Fuchs, Ausayakhun, Ruckphaopunt, Tansuhaj, & Suskind, 1994; Hadi et al., 2000). Fuchs et al. (1994) found that plasma retinol measurements (one type of VAD measurement) were associated with height ($P < 0.003$) and stunting ($P < 0.001$) among preschool children in Thailand (Fuchs et al., 1994). Also, Hadi et al. (2000) suggest that the vitamin A supplementation improved the linear growth among Indonesian preschool children (Hadi et al., 2000).

2.6 Conceptual Framework

There are several factors affecting child stunting mentioned in this model. The factors are divided into three groups, which are household factors, child feeding practice factors and child characteristics. The household factors include mother's educational level, housing standard, latrine availability, water source, and birth order and number of living children. Child feeding practice factors are duration of breastfeeding, vitamin-A supplement, and intestinal parasite treatment. Child characteristics, which are the control factors, comprise residential area, age, gender, weight when born, and mother's age at birth.

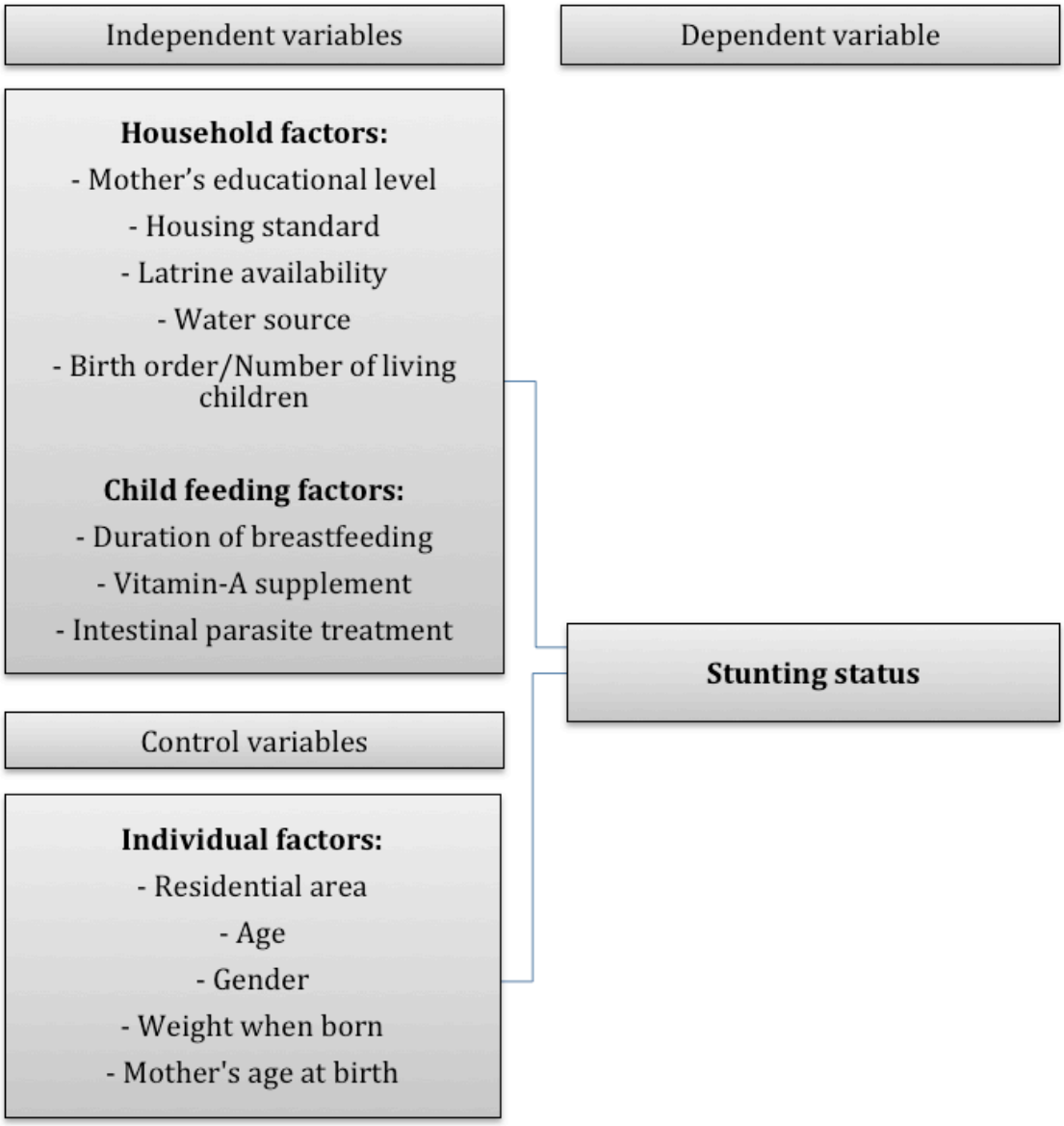

Figure 2.6 Conceptual Framework

2.7. Research Hypotheses

1) There exists an association between the child characteristics and stunting status of the Raglai children.

2) There exists an association between household factors and stunting status of the Raglai children.

3) Child feeding practice factors are significantly associated with stunting status of the Raglai children.

CHAPTER III
RESEARCH METHODOLOGY

3.1 Source of Data

The study uses the data from an anthropometric (physical measurement of the human individual) and nutritional combined study of Ethnic Minority Raglai People in the two mountainous districts, which are Khanh Son and Khanh Vinh, of Khanh Hoa Province, Vietnam. The study was conducted by the Khanh Hoa Department of Health in order to identify the association between anthropometric status and related factors. The survey was divided into four age groups, which are 0-4, 5-9, 10-19 and 20-49 years; this study analyzes the data for age 0-4. Data collection began in June 2013.

The Khanh Hoa Department of Health used two-stage cluster sampling and systematic random sampling methods for the data collection. The study included all the rural communes and townships, totally 20 communes and two townships, which are the subdivisions of the districts. The rural communes are areas dominated by agricultural practices while townships are urban areas with more diversified economic base and higher population density than rural communes. However, the population size, revenue received from taxes, and land area are not considered in defining whether areas are designated as communes or townships.

For the detailed sampling framework, two random villages for each rural commune and three random villages for each township were chosen. Then from the lists of all the children of selected villages, which were provided by Khanh Hoa Department of Population and Family Planning, systematic sampling was used to choose the children. For collecting the data, the caretakers (99% were the mothers of the children) were asked to bring their children to the health centers in the two districts. Then the children were measured their weight and height, and got checkups for several symptoms by the medical personnel. After that, the caretakers were requested to answer all the questions in the survey at the health centers. All the

participants were given a small amount of money, which was 40,000 Vietnamese Dong (roughly equal to two United State Dollars at that time). For those who could not go to the health facilities, the researchers, who directly came to their houses, measured them, and collected the information from their caretakers. Those cases were also given the same amount of money.

Figure 3.1 Administrative divisions in Khanh Son and Khanh Vinh district

3.2 Study Design and Sample Size

This study is non-experimental and cross-sectional and uses data from an anthropometric research among Raglai people by Khanh Hoa Department of Health as secondary data. The study uses all the data from the 0-4 group determined as under-5 children, which has 1,365 cases after dropping out those containing implausible values (from total 1,420 cases). The study uses the measured height and age of the children to calculate the Z-score in order to define whether a child is stunted or not.

3.3 Limitations of the Data

There are some limitations of the data used for this study. Because the data set used by this study was collected for not only stunting specifically but also other purposes, so there are limited options among the study variables. For example, a study about malnutrition, especially stunting, needs exclusive breastfeeding factor, which is not included in the survey. Furthermore, the birth order variable offers the inappropriate categories, which are first child, middle child and last child. By using this variable, it is unable to identify the accurate birth order of a child. Thus the study tries combining the birth order and number of living children variables according to

the hypotheses from Horton's study (1988), which are that the disadvantages of the children are resulted from having high birth order and living with many siblings.

There is a limitation about child age variable. The explanation for this phenomenon is because the lists of the children that were used for sampling were made at the time that the proposal was written, in November 2012. Then there was a long progress of administrative procedure for the research's approval, which is a prevalent problem in Vietnam. The sampling lists were not updated when fieldwork began seven months later, thus newborn babies up to age seven months were not included in those lists. However, there were eleven children aged below seven months in the dataset. This is because these children were replacements for children on the lists that could not be located, who probably moved out of the original areas or did not meet the inclusion criteria. These children were mostly the next-door neighbors of the missing children, and they were picked for fulfilling the expected sample size. For these reasons the data contains a very small number of children whose age were below 12 months (3.74%), thus they were combined with the next older group, which is 12-23.

3.4 Operational Definition of the Variables

The main target of the study is to determine the relationship between households, child feeding practice factors and stunting status among Raglai under-5 children in Khanh Hoa province, Vietnam. The definitions of the independent variables and the outcome variable are as below:

Table 3.1 Operational definitions of variables

Variable Name	Description and Category	Type of Variable
Dependent variable		
Stunted growth	The child whether has stunted growth or not No = 0; Yes = 1	Dichotomous

Table 3.1 Operational definitions of variables (cont.)

Variable Name	Description and Category	Type of Variable
Independent variables		
Individual factors		
Residential area	Area that the child whose household is resident Rural commune = 0 Township = 1	Dichotomous
Age (month)	Age of the child measured in month < 24 = 1 24-35 = 2 36-47 = 3 48-59 = 4	Categorical
Gender	Gender of the child Male = 0 Female = 1	Dichotomous
Weight when born	Child's birth weight ≥ 2,500 gram = 1 < 2,500 gram = 2 Not remember = 3 Not measure = 4	Categorical
Mother's age at birth	Age of the mother of the child when giving birth ≥ 35 years = 1 20-34 years = 2 < 20 years = 3	Categorical
Household factors		
Mother's educational level	Child's mother's completed grade in school, it is categorized into 4 groups High school = 1 Secondary school = 2 Primary school = 3 No education = 4	Categorical
Housing standard	Type of house in which the child lives High/average standard = 0 Low standard = 1	Dichotomous
Latrine availability	The child lives in household, which whether has latrine or not Yes = 0 No = 1	Dichotomous
Water source	The source of water that the child's family uses Piped water = 1 Well = 2 Stream = 3	Categorical

Table 3.1 Operational definitions of variables (cont.)

Variable Name	Description and Category	Type of Variable
Birth order/Number of living children	Birth order/How many living children the mother of the child currently has Only child = 1 Oldest of two = 2 Youngest of two = 3 Among 3-4 children = 4 Among ≥ 5 children = 5	Categorical
Child feeding practice factors		
Duration of breastfeeding	The child's breastfeeding duration is shorter than expected ≥ 24 months = 1 < 24 months = 2 Not remember = 3 Has not breastfed = 4	Categorical
Vitamin-A supplement	The child whether has any Vitamin-A supplement in the last 6 months Yes = 0 No/not remember = 1	Dichotomous
Intestinal parasite treatment	The child whether has any Intestinal parasites treatment in the last 6 months Yes = 0 No/not remember = 1	Dichotomous

3.5 Data Analysis

The analysis part of the study starts by managing all the data from the original data set. The managing data process includes checking and cleaning the data, selecting the variables, which can use for generating the required variables, then recoding the variables following the operational definition.

For the entire analysis part, data is managed and the results are measured by using STATA SE 13 software. For the dependent variable, the Z-scores are calculated by using WHO Anthro macro for STATA, and then are re-categorized into two groups, which have been mentioned above.

After managing the data, the analyses are performed step by step in three parts: descriptive analysis demonstrates the frequencies or the means distribution of dependent variable, individual factors, household factors, and child feeding practice factors. Then, the bivariate analysis is conducted to investigate the relationship of each

independent factor to the child's stunting status by using cross-tabulation with Chi-Squared scores. The multivariate analysis is applied for examining the relationship between each independent factor and the outcome variable while controlling for the other variables by using Logistic Regression. All the statistical tests are interpreted with odds ratio and the confidence intervals of 95%, 99% and 99.9%.

CHAPTER IV
RESEARCH FINDINGS

The results of the analysis section are divided into three parts: univariate analysis, bivariate analysis and multivariate analysis. Univariate analysis describes the frequency and percentage distribution of the dependent variable, which is stunting prevalence, household factors and child feeding practice factors. Bivariate analysis illustrates the stunting prevalence among the categories of the independent variables, and examines whether there is any significant difference. Multivariate analysis shows relationships between each of the independent variables and the dependent variable when controlling the other variables. The results are presented with the odds ratio and 95% confidence interval.

4.1 Univariate Analysis

As can be seen from Table 4.1, out of 1,365 cases, there are 909 children, which are about two-third of under-five Raglai children, were stunted.

Table 4.1 Frequency and percentage distributions of child stunting prevalence

Variable (n=1,365)	Percentage
Child is stunted	
No	33.4
Yes	66.6

Table 4.2 shows the frequency and percentage distribution of the control variable, which are child characteristics. The majority of the children (89%) live in rural communes and the rest lives in townships. The age group having the highest percentage (about 30%) is 36-47 months while below 24 months age group takes account about 19%. The distribution between the genders of the children is fairly equal with a slightly greater percentage (51.3%) of boys. Comparing birth weight among the

children, there are 304 children (22%) having their weight at birth below 2,500 grams while 703 children (51.5%) had a birth weight of 2,500 grams and above. Children with their mothers whose ages at birth were within 20 to 34 years are dominant with 69%.

Table 4.2 Frequency and percentage distributions of child characteristics

Variable (n=1,365)	Percentage
Residential area	
Rural commune	89.1
Township	10.9
Age (months)	
< 6	0.6
6-11	3.1
12-23	15.4
24-35	28.1
36-47	30.3
48-59	22.5
Gender	
Male	51.3
Female	48.7
Birth weight	
≥ 2,500 gram	51.5
< 2,500 gram	22.3
Not remember	9.7
Not measure	16.0
No response	0.5
Mother's age at birth	
≥ 35 years	9.5
20-34 years	68.9
< 20 years	21.6

The results from Table 4.3 suggest that nearly 40% of the children's mothers had no education while the percentage of those who attained high school level is 10%. More than one-third of the children (37%) live in houses with low standard. Among the children's households, using water from stream (54.6%) and well (34.0%) is more common than from piped water. Approximately 84% of households have no toilet. The children who were the only child, youngest of two children, and one of

three to four children have a similar pattern, which take account one-fourth of the reported children.

Table 4.3 Frequency and percentage distributions of household factors

Variable (n=1,365)	Percentage
Mother's educational level	
High school	10.0
Secondary school	23.4
Primary school	25.1
No education	39.4
No response	2.1
Housing standard	
Average/high standard	62.6
Low standard	36.8
No response	0.6
Water source	
Piped water	11.6
Well	33.8
Stream	54.6
No response	0.1
Latrine availability	
Yes	15.9
No	83.8
No response	0.3
Birth order/number of living children	
Only child	25.6
Oldest of two	9.9
Youngest of two	22.8
Among 3-4 children	27.1
Among ≥ 5 children	12.9
No response	1.7

Regarding Table 4.4, the proportion of children who had duration of being breastfed below 24 months is 56.2% and for those who had breastfeeding duration of 24 months and longer is 36.4%. There are 51 children whose mothers did not remember (3.7%), and 47 children who had not been breastfed (3.4%). There are about three-fourths of the children having vitamin-A supplement in the last six months. Approximately one-fourth of the children received intestinal parasite treatment.

Table 4.4 Frequency and percentage distributions of child feeding practice factors

Variable (n=1,365)	Percentage
Duration of breastfeeding	
≥ 24 months	36.4
< 24 months	56.2
Not remember	3.7
Has not breastfed	3.4
No response	0.2
Vitamin-A supplement	
Yes	74.1
No/not remember	25.8
No response	0.2
Intestinal parasite treatment	
Yes	23.8
No/not remember	76.0
No response	0.2

4.2 Bivariate Analysis

The bivariate analysis shows the cross-tabulation between the dependent variable and independent variables in order to illustrate the frequency distribution of the categories of the independent variables. Besides, by using the Pearson's Chi-square test, the analysis examines whether there is any significant difference between the percentage distributions among the categories of each of the independent variables.

The results from Table 4.5 demonstrate the frequency distribution of the categories of the control variables. About two-thirds (66%) of the children living in rural communes are stunted while the proportion of stunted children living in townships is higher, which takes 72.5% of all children living in those urban areas. Although there is no significant difference found between these two categories. Regarding child age, the patterns look similar among the age groups between 24 to 59 months. There are 68% to 72% of all the children are stunted among these age groups while the stunting prevalence in below 24 months age group takes account only 52.5%. The difference among child age groups is significant at 0.001 level. For child gender, the difference of stunting prevalence between boys and girls is found significant ($p<0.001$). Stunted girls take account about three-fourths of all girls while

only nearly six out of ten boys are stunted. Taking birth weight into account, the high-risk groups, which are children with birth weight below 2,500 grams, children whose birth weight was not measured or their parents did not remember, have a similar pattern of stunting prevalence. The proportions of stunted children of these groups are approximately three-fourth (72% to 77%) of all the children in same categories. A significant difference is found ($p<0.001$) with the lower stunting prevalence among children with birth weight of 2,500 grams and above (59%). A look at mother's age at birth, the stunting prevalence patterns of 20 to 34 years group and below 20 years group look similar with the percentages of 65% and 67% respectively. Meanwhile, about 74% of the mothers whose ages are 35 and above have stunted child. However, the difference is not found significant.

Table 4.5 Frequency and percentage of stunting prevalence by child characteristics

Variable	Stunted (Percentage)		N	P-value
	No	Yes		
Residential area			1,365	0.106
Rural commune	34.1	65.9	1,216	
Township	27.5	72.5	149	
Age (months) * **			1,365	**0.000**
<24	47.5	52.5	261	
24-35	31.9	68.2	383	
36-47	30.2	69.8	414	
48-59	27.7	72.3	307	
Gender * **			1,365	**0.000**
Male	41.0	59.0	700	
Female	25.4	74.6	665	
Birth weight * **			1,358	**0.000**
≥ 2,500 gram	41.4	58.6	703	
< 2,500 gram	25.0	75.0	304	
Not remember	27.8	72.2	133	
Not measure	23.4	76.6	218	
Mother's age at birth			1,365	0.163
≥ 35 years old	26.4	73.6	129	
20-34 years old	34.6	65.4	941	
< 20 years old	32.5	67.5	295	

Note: * $p<0.05$; ** $p<0.01$; *** $p<0.001$

Table 4.6 illustrates the bivariate results among household factors. The difference between the categories of mother's educational attainment variable is found significant ($p<0.001$) The percentage of stunted children is half of all children, whose mothers attained high school level. The proportions of stunted children whose mothers finished secondary and primary education are similar (about 63%) while the prevalence is much higher among those whose mothers had no education (76%). For housing standard, no significant difference is found with shown similar patterns between two categories. The percentages of stunted children living in houses with average or high standard and those living in low-standard houses are 65.6% and 68.5% respectively. As seen from water source variable, the stunting prevalence is seen to be lower for children whose households use water from piped water (58%) than those whose households using water from wells and stream (68% and 67% respectively). However, the difference is not significant. Regarding results of latrine availability shows a significant difference ($p<0.05$) of stunting prevalence between children living in households with latrine (60%) and without latrine (68%). The results of birth order and number of living children demonstrate an increasing trend of stunting prevalence from children who are only child to children having higher birth order or number of siblings. Sixty percent of children having no siblings, who are the lowest prevalent group, are stunted while the highest prevalent category, which is children among five siblings, has proportion of stunted children of 76%. The difference among the categories is found significant.

Table 4.6 Frequency and percentage of stunting prevalence by household factors

Variable	Stunted (Percentage)		N	P-value
	No	Yes		
Mother's education ***			1,337	**0.000**
High school level	50.4	49.6	137	
Secondary school level	37.5	62.5	320	
Primary school level	36.6	63.4	342	
No education	24.0	76.0	538	

Note: * $p<0.05$; ** $p<0.01$; *** $p<0.001$

Table 4.6 Frequency and percentage of stunting prevalence by household factors (cont.)

Variable	Stunted (Percentage)		N	P-value
	No	Yes		
Housing standard			1,357	0.272
Average/high standard	34.4	65.6	855	
Low standard	31.5	68.5	502	
Water source			1,364	0.057
Piped water	41.8	58.2	158	
Well	31.7	68.3	461	
Stream	32.8	67.3	745	
Latrine availability *			1,361	**0.020**
Yes	40.1	59.9	217	
No	32.0	68.0	1,144	
Birth order/Number of living children **			1,342	**0.001**
Only child	40.3	59.7	350	
Oldest child among two	38.5	61.5	135	
Youngest child among two	33.4	66.6	311	
Having 3-4 siblings	28.9	71.1	370	
Having ≥5 siblings	23.9	76.1	176	

Note: * $p<0.05$; ** $p<0.01$; *** $p<0.001$

Table 4.7 indicates the bivariate results of child feeding practice factors. For duration of breastfeeding, 73.4% of children who were breastfed for the first 24 months or longer have stunted growth while about 63.0% of children having duration of breastfeeding below 24 months are stunted. There are 34 children (66.7%) whose caretakers did not remember the duration of breastfeeding and 26 children (55%) who had not been breastfed are stunted. The difference is found significant at 0.001 level. Neither vitamin-A supplement nor intestinal parasite treatment are found significantly different among the categories. The stunting prevalence of children who got vitamin-A supplement is 65% and those who did not is 70%. For intestinal parasite treatment, the prevalence is 64% for those who got the treatment and 67% for those who did not.

Table 4.7 Frequency and percentage of stunting prevalence by child feeding practice factors

Variable	Stunted (Percentage)		N	P-value
	No	Yes		
Duration of breastfeeding ***			1,362	**0.000**
≥ 24 months	26.6	73.4	497	
< 24 months	37.3	62.7	767	
Not remember	33.3	66.7	51	
Has not breastfed	44.7	55.3	47	
Vitamin-A supplement			1,363	0.101
Yes	34.6	65.4	1,011	
No/not remember	29.8	70.2	352	
Intestinal parasite treatment			1,363	0.265
Yes	36.0	64.0	325	
No/not remember	32.7	67.3	1,038	

Note: * p<0.05; ** p<0.01; *** p<0.001

4.3 Multivariate Analysis

The multivariate analysis includes all the variables from the previous analyses. Logistic regression analysis is applied for examining the relationships between the child characteristics, household and child feeding practice factors. The results are presented under the odds ratio, p-value and 95% confidence interval.

The results from Table 4.8 suggest that, considering each child characteristic and controlling the other variables, children who lived in townships are about 1.7 times more likely to be stunted than those who lived in rural communes (p<0.05). The children whose age group was 24-35 (p<0.05), 36-47 and 48-59 months (both with p<0.01) have significantly greater odds of being stunted than those who were within below 24 months age group. Girls have double chance to be stunted than boys (p<0.001). Children who had their birth weight below 2,500 grams and had no birth-weight measurement are more likely to have stunted growth than those whose birth weight is 2,500 grams and above (both with p<0.01). In contrast with other control variables, mother's age at birth is found not significantly related to child stunting.

Regarding to household factors, controlling other variables, children whose mothers have no education have significantly greater odds of stunting than those whose mothers attained high school level ($p<0.01$). Children living in houses with low standard are significantly more likely to be stunted than those living in houses with average or high standard ($p<0.05$). Children who lived in households using water from wells ($p<0.001$) and stream ($p<0.05$) have significantly greater risks having stunted growth than children living in households using water from piped water. Children living in households with three to four, and five children and above are significantly more likely to be stunted (both with $p<0.05$). Latrine availability has no significant relationship with stunting. Besides, none of child feeding practice factors (duration of breastfeeding, vitamin-A supplement and intestinal parasite treatment) is found significantly related to the dependent variable.

Table 4.8: Odds ratio of household and child feeding practice factors controlling for the child characteristics on stunting status among under-five Raglai children with 95% confidence interval

Child is stunted	Odds ratio	Standard error	Confidence interval (CI)	P-value
Residential area				
Rural commune	1.00			
Township	1.72	0.41	1.08-2.74	**0.021**
Age (months)				
<24	1.00			
24-35	1.57	0.31	1.06-2.32	**0.023**
36-47	1.84	0.37	1.24-2.74	**0.003**
48-59	2.02	0.44	1.32-3.08	**0.001**
Gender * **				
Male	1.00			
Female	2.17	0.28	1.68-2.79	**0.000**
Weight at birth *				
≥ 2,500 grams	1.00			
< 2,500 grams	1.77	0.29	1.28-2.45	**0.001**
Not remember	1.46	0.36	0.91-2.36	0.116
Not measure	1.70	0.34	1.15-2.52	**0.008**

n=1,290; R2=0.0944; Note: * p<0.05; ** p<0.01; *** p<0.001

Table 4.8: Odds ratio of household and child feeding practice factors controlling for the child characteristics on stunting status among under-five Raglai children with 95% confidence interval (cont.)

Child is stunted	Odds ratio	Standard error	Confidence interval (CI)	P-value
Mother's age at birth				
≥ 35 years	1.00			
20-34 years	1.07	0.30	0.62-1.85	0.811
< 20 years	1.49	0.50	0.77-2.86	0.237
Mother's educational level * **				
High school	1.00			
Secondary school	1.53	0.35	0.98-2.41	0.063
Primary school	1.33	0.31	0.84-2.12	0.225
No education	2.15	0.52	1.33-3.45	**0.002**
Housing standard * **				
Average/high standard	1.00			
Low standard	1.37	0.20	1.03-1.81	**0.031**
Water source *				
Piped water	1.00			
Well	2.20	0.50	1.41-3.43	**0.000**
Stream	1.66	0.36	1.08-2.56	**0.020**
Latrine availability				
Yes	1.00			
No	1.00	0.18	0.70-1.43	0.985
Birth order/number of living children * **				
Only child	1.00			
Oldest of two	0.94	0.23	0.59-1.51	0.804
Youngest of two	1.28	0.26	0.86-1.91	0.228
Among 3-4 children	1.69	0.38	1.09-2.62	**0.018**
Among ≥ 5 children	2.00	0.63	1.08-3.70	**0.028**
Duration of breastfeeding				
≥ 24 months	1.00			
< 24 months	0.84	0.13	0.62-1.13	0.251
Not remember	0.69	0.25	0.34-1.39	0.299
Has not breastfed	0.51	0.18	0.26-1.01	0.053
Vitamin-A supplement				
Yes	1.00			
No/not remember	1.12	0.18	0.82-1.53	0.480

n=1,290; R2=0.0944; Note: * p<0.05; ** p<0.01; *** p<0.001

Table 4.8: Odds ratio of household and child feeding practice factors controlling for the child characteristics on stunting status among under-five Raglai children with 95% confidence interval (cont.)

Child is stunted	Odds ratio	Standard error	Confidence interval (CI)	P-value
Intestinal parasites treatment				
Yes	1.00			
No/not remember	1.32	0.21	0.97-1.79	0.076
Constant	0.13	0.06	0.05-0.34	**0.000**

n=1,290; R2=0.0944; Note: * p<0.05; ** p<0.01; *** p<0.001

CHAPTER V
DISCUSSIONS AND RECOMMENDATIONS

5.1 Discussions

The objectives of this study are exploring the stunting prevalence among under-five Raglai children and examining the relationship between household and child feeding practice factors. The following discussions will give the comparison of the findings in this study with the previous findings and then explain the phenomena according to the author's knowledge and judgment.

The study finds that the stunting prevalence of the Raglai children is 66.6% (two-thirds of the Raglai children) and is defined to be very high following the WHO's cut-off points (WHO, 2010). According to the results from a previous research by Khanh Hoa Department of Health (2012), the stunting prevalence of the general children in Khanh Son and Khanh Vinh districts were 38.8% and 34.0% respectively and the prevalence among Raglai children was three times higher than the stunting rate among Kinh (majority ethnic group) children (Khanh Hoa Department of Health, 2015). Thus the results of this study show the evidence of very high stunting prevalence among Raglai children and support the findings from the previous research in order to assume that there is a huge gap between the stunting prevalence among Raglai children and the majority ethnic children.

As can be seen from the results that the common residential areas of the reported Raglai children are rural communes (89%). Despite no significant difference been found in bivariate analysis, the study found that children living in townships are significantly more likely to be stunted than those who lived in rural communes in multivariate analysis. There is a contrast between the results of this study and a study on general (ethnic majority) children in Nghean, Vietnam, which showed the greater risk of being stunted among children living in rural area. The possible explanation for the odd results is may be because the children with less educated caretakers, who are more likely to be stunted, are less likely to be brought to the health centers in rural

areas. This is probably because the health centers were less accessible in rural areas, since more educated caretakers are more likely to concern about their children's health, thus they were more motivated to bring their children to the health facilities than less educated parents. Meanwhile, the health centers in urban areas were more reachable so they were available for not only children with high-educated parents but also those with low-educated caretakers. Thus there is a bias, which comes from differences in the likelihood of coming to the facility.

The relationship between age of the children and stunting status in this study is significant, and it shows the same pattern with previous studies. The older the child is, the more likely the child has stunted growth. It reinforces the hypothesis that stunting is a chronic undernutrition, and it shows the effects more clearly in later life. Furthermore, the children in early period of life are protected by the nutrition from breastfeeding before demanding more complex feeding in later ages (Le, 2001; Zottarelli et al., 2007).

About the gender of the children, girls are twice as likely to be stunted than boys. However, the result is different from the finding in a previous study in Khanh Son district, which found the significantly greater odds of stunting among boys. Several studies are mentioned in Hill and Upchurch's study (1995) in order to conclude that there were female disadvantages in some regions such as China and India. The girls were often seen as a burden and boys were seen as resource, thus "girls were fed less and suffered more malnutrition" (p. 127) in those communities. Since it is very little-known about Raglai community, this might be an explanation for why Raglai girls are more likely to be stunted than boys (Hill & Upchurch, 1995; Le, 2001).

The results suggest that the children who had a birth weight below 2,500 grams and was not measured their birth weight have higher odds of being stunted than those having a birth weight of 2,500 and above. Children who were not measured their birth weight have higher risk of being stunted probably because they were born in the places where people there were not aware of the children's health status. Comparing with the previous study in Khanh Son district, the percentage of children weighed at birth has been increased from 36.7% to 73.8% since 2001 (Hien & Hoa, 2009; Le, 2001).

Regarding mother's educational attainment, nearly 40% of the children having illiterate mothers. It reflects how poor the socio-economic condition was in those areas, because high educational attainment can represent the well-being of a particular population. Besides, mothers with low educational level may not have enough knowledge to feed their children properly. The results from this study show that mother's educational attainment contributed to stunting status among Raglai children with its significant association with the outcome variable. The children whose mothers were illiterate are more likely to be stunted than those with mothers having high school level. The study in Nigeria found the similar pattern that children who were born to mothers with no formal education were four times more likely to be stunted than those born to mother who had completed more than primary education (Ajao et al., 2011).

There is a significant association between housing standard and stunting when controlling other factors, however, the relationship is not clear since it is not significant in the bivariate analysis. Housing standard reflects wealth of households. Parents living in houses with good standard are more likely to afford not only more nutritious food, because of having higher income, but also better hygiene and sanitary conditions for their children because a good house may provide better sewage system and safe water than a low-standard house. A study by Fenske in 2013 found a relationship between lower wealth index score and higher chance of having stunted child. This can indirectly explain why children living in houses with low standard are more likely to be stunted than those living in houses with average or high standard (Fenske, Burns, Hothorn, & Rehfuess, 2013).

The results of this study show the small percentage of children living in households using piped water (11.6%). Most of the reported households used the water from wells and surface water (mostly from stream). It indicates that those areas had low infrastructure-level, which reflects the low economic status and lack of attention from the local government. Even though in Le's study, water from wells is considered as a good water source, the current findings found that using water from well is the highest risk factor affecting stunting comparing with the other categories. Despite the strongly significant relationship between water source and stunting in multivariate analysis, the direct effect of this variable on stunting is not significant. To clarify the

results, it's probably because people in those areas did not keep the sanitation for the good water sources, such as water from wells, and did not regularly boil the water for feeding the babies. Because drinking unsafe water leads to higher chance of getting diarrhea, which affects child nutrition. However, it shows an improvement in the Raglai community since there existed no water supply system more than 10 years ago (Le, 2001).

Though latrine availability is not found significantly related to stunting in multivariate analysis, the results from bivariate analysis suggest the higher rate of stunting among children living in households with no toilet. According to the cross-tabulation between latrine availability and certain variables, the statistics show that the households with no latrine tend to have low mother's educational level and use unsafe water. Thus the latrine availability reflects the well-being of the households. Living in households with available latrine is more likely to have better living conditions, hygiene and sanitation. However, the rate of households having no toilet is very high among the community (84%) and this low hygienic condition is assumed to contribute to the high rate of stunting among Raglai children.

According to current findings, children who were born in the families with many children (more than two) are more likely to be stunted than those who were born in smaller families. From cross-tabulation between several variables, the Raglai women tended to give many births, especially among those with low educational level. The relationship between family size and stunting is found and explained in Horton's study (1988). Birth order of the children and number of children affect child nutrition due to availability of family resources and parents' attention. This explanation is appropriate for the current results when the economic status is low among Raglai people. Therefore, sharing food, care and other resources may lead the children into poor nutrition (Horton, 1988).

None of child feeding practice factors is found significantly associated to child stunting status in the multivariate analysis. However, the duration of breastfeeding is found significantly associated with the dependent variable in the bivariate analysis. The children having duration of breastfeeding of 24 months and above are more likely to be stunted than those with the breastfeeding duration of below 24 months. The findings show the different patterns from a previous study in

Ethiopia (2014) and also suggest the unexpected results from the WHO's recommendations since these sources propose that two years and above is the ideal duration of breastfeeding for preventing stunting among children. However, the literature of the child feeding practices among Raglai caretakers has not been found (Fikadu et al., 2014; WHO, 2003).

There is another explanation for the odd results of the duration of breastfeeding. It is hard to define how well the children were fed by using the selected factors. Because the ideal child feeding practices during the first two years include exclusive breastfeeding for the first six months, continuing breastfeeding for two years or more and complementary feeding starting at the age of six months (WHO, 2003). And even the children having proper feeding duration, they should be fed by nutritious food also. It is considered as another limitation when there is lack of information about feeding practices, such as what food given to the children and exclusive breastfeeding.

Besides, vitamin-A supplement and intestinal parasite treatment are not the direct factors affecting child stunting even though they are found related to stunting in some previous studies (Fuchs et al., 1994; Kent et al., 1988). These factors are assumed that they are related to child nutrition because the parents who concern and put effort to do these kinds of health-related behaviors are likely to know more about child health such as how to feed their children properly.

5.2 Conclusion

Stunting has been an emerged issue recently since it gets less attention than the other forms of undernutrition and is often unrecognized by most of communities. The stunting prevalence in Vietnam has shown decreasing over the past 15 years. However, the stunting rate among the ethnic minorities is still very high and there exists a very low socio-economic status and inappropriate living conditions for child development. Furthermore, little is known about ethnic groups in Vietnam, thus they seem to get lack of attention from the community. For the objectives, this study aims to explore the stunting prevalence and to examine the relationship between household and child feeding practice factors among Raglai children. The results suggest a very high stunting prevalence among Raglai community in Khanh Hoa

province, that two-thirds of children were stunted in 2013, when the survey was conducted. The statistics show the evidence of low socio-economic status in the society even though there have been some improvements since more than 10 years ago. Among the focused factors in this study, mother's educational attainment is the most important factor since it can represent the well-being of a community, which strongly affects the nutritional status of the children. Latrine availability and duration of breastfeeding are found significantly related to stunting in bivariate analysis but the relationships are not significant when controlling the effects of other variables. Meanwhile, residential area, housing standard and water source are found significantly associated with the outcome variable in multivariate analysis but do not have direct effect on child stunting. Beside mother's educational level, birth order is also significant related to child stunting in both analyses among household factors. No relationship between child feeding practice factors and stunting is seen significant in logistic regression analysis. For control variables, age, gender and weight at birth are strongly related to child stunting.

5.3 Recommendations

According to the findings in this study, certain recommendations are given in order to improve the stunting status of the children in Raglai community. For short-term solutions, providing food, clean water and other resources for low-income households should be considered so they may use financial resources to buy nutritious food for the children. Besides, using media to give knowledge of how to feed the children properly is necessary to let the caretakers practice positive child feeding habits.

For long-term solutions, encouraging Raglai people to go to school and attain the highest level of basic education. Infrastructure and utilities, especially for education, medical centers, and hygiene and sanitation, should be enhanced in the community. Introducing and providing income generating activities should be applied because when the parents do not have to concern about the basic needs, they are more likely to send their children to school. Beside that, they can improve their living condition and increase family resources, which can affect positively child nutrition,

especially in households with many children. Improving the skills of health personnel in counseling and giving adequate information about child nutritional status and child feeding practices after the women giving birth, including encouraging them to measure their children's birth weight. For further study, it is suggested that detailed child feeding practice information, such as exclusive breastfeeding and feeding food, should be included. For household factors, incomes per capita and number of family members are necessary to be examined. Since the areas where the Raglai community lives are mountainous with lack of healthcare services, it is assumed that there should be some health access factors included in the survey. Small mothers can also affect child stunting, so it is suggested that further study should include mother's height.

5.4 Limitations of the Study

The results of this study suggest some flaws from the original study, especially from the sampling part. By collecting the information of the children at the health centers, the resulting data might be biased because of the children's residential areas. The caretakers who live in urban areas and are more educated are more likely to bring their children to the health centers. The bias exists because the children who live in urban areas and have educated parents are less likely to be stunted.

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