Women’s status and child nutrition

Findings from community studies in Bangladesh and Nicaragua

SHIRIN ZIAEI
Abstract

The importance of women’s status for child nutrition has recently been recognized. However, pathways through which women’s status can affect their caretaking practices and child nutrition have not been fully determined. The aim of this thesis was to evaluate associations between aspects of women’s status – including exposure to domestic violence and level of autonomy and social support – with their level of stress, feeding practices and child nutritional status in two different cultural settings: Bangladesh and Nicaragua.

Data were acquired from population-based studies. For Study I we used data from the Bangladesh 2007 Demographic and Health Survey, and Study II was embedded in the 2009 Health and Demographic Surveillance System conducted in Los Cuatro Santos, rural Nicaragua. Studies III and IV were part of the MINIMat study, conducted in rural Bangladesh. In-person interviews were conducted and validated questionnaires were used in each of the studies. Anthropometric characteristics of the children were recorded based on standardized World Health Organization techniques.

In Bangladesh, we found women with lifetime experience of domestic violence to be more likely to report emotional distress during pregnancy, cease exclusive breastfeeding before 6 months and have a stunted child. Further, we found a negative association between experience of domestic violence and duration of exclusive breastfeeding to be mitigated with breastfeeding counseling. In Nicaragua, a lower level of maternal autonomy was associated with more appropriate breastfeeding practices such as higher odds of exclusive breastfeeding and longer continuation of breastfeeding. Further, a maternal lower level of social support was associated with better child nutritional status.

In conclusion, this investigation showed that different dimensions of women’s status were associated with their feeding practices and child nutritional status and also revealed that the strength and direction of these associations may vary by the child’s age, setting and other contextual factors. These findings suggest that women’s status might have an important public health impact on child health and its role should be considered in programs and policies aiming to improve child health and nutrition.

Keywords: Women's status, Domestic violence, Autonomy, Social support, Feeding practices, Child nutrition, Bangladesh, Nicaragua

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To my beloved parents
List of Papers

This thesis is based on the following papers, which are referred to in the text by their Roman numerals.


IV Frith AL, Ziaei S, Naved RT, Khan AI, Kabir I, Ekstrom EC. (2016) Breastfeeding counseling mitigates the negative association of domestic violence on exclusive breastfeeding duration in rural Bangladesh. The MINIMat randomized trial. *Submitted*

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Abbreviations

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<tr>
<td>APRODESE</td>
<td>Asociación para el Desarrollo Económico y Social El Espino</td>
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<td>BAZ</td>
<td>BMI-for-Age Z-score</td>
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<td>BDHS</td>
<td>Bangladesh Demographic and Health Survey</td>
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<td>BF</td>
<td>Breastfeeding</td>
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<td>BFC</td>
<td>Breastfeeding Counselling</td>
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<td>BMI</td>
<td>Body Mass Index</td>
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<td>CBF</td>
<td>Continued Breastfeeding</td>
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<td>CTS</td>
<td>Conflict Tactic Scale</td>
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<td>DV</td>
<td>Domestic Violence</td>
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<td>EBF</td>
<td>Exclusive Breastfeeding</td>
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<td>FFQ</td>
<td>Food Frequency Questionnaire</td>
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<td>GEE</td>
<td>Generalized Estimated Equations</td>
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<td>HAZ</td>
<td>Height-for-Age Z-score</td>
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<td>HDSS</td>
<td>Health and Demographic Surveillance System</td>
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<td>HP</td>
<td>Highly Processed</td>
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<tr>
<td>HPA</td>
<td>Hypothalamic-Pituitary-Adrenocortical</td>
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<tr>
<td>ICDDR, B</td>
<td>International Center for Diarrheal Diseases Research, Bangladesh</td>
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<td>IPV</td>
<td>Intimate Partner Violence</td>
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<td>LA</td>
<td>Latin America</td>
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<td>LBW</td>
<td>Low Birth Weight</td>
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<td>MAD</td>
<td>Minimum Acceptable Diet</td>
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<td>MDD</td>
<td>Minimum Dietary Diversity</td>
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<td>MINIMat</td>
<td>Maternal and Infant Nutrition Intervention, Matlab</td>
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<td>MMF</td>
<td>Minimum Meal Frequency</td>
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<tr>
<td>PTSD</td>
<td>Post-Traumatic Stress Disorder</td>
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<td>SA</td>
<td>Southern Asia</td>
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<td>SD</td>
<td>Standard Deviation</td>
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<td>SSA</td>
<td>Sub-Saharan Africa</td>
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<td>SSB</td>
<td>Sugar-Sweetened Beverages</td>
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<td>SRQ</td>
<td>Self-Reported Questionnaire</td>
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<td>UHM</td>
<td>Usual Health Message</td>
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<td>UNICEF</td>
<td>United Nations Children’s Emergency Fund</td>
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<td>WAZ</td>
<td>Weight-for-Age Z-score</td>
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<td>WHO</td>
<td>World Health Organization</td>
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<td>WHZ</td>
<td>Weight-for-Height Z-score</td>
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Glossary and Definitions

**Controlling behavior:** Any behavior, such as isolation, monitoring one’s movement, or restricting his/her access to resources and information, enacted for the purpose of controlling any other individual (1, 2).

**Emotional violence:** Any behavior, such as insult, humiliation or threat, that causes emotional harm or trauma (2).

**Emotional distress:** Having symptoms of depressive and anxiety disorders, such as headache, tiredness, crying and suicidal thoughts, which are typically encountered in community and primary care settings (3).

**Food insecurity:** Limited access or uncertain availability of food needed for a healthy and active life for all household members in terms of quantity, quality, safety, cultural acceptance and future expectation (4).

**Growth faltering:** A situation where a child’s growth pattern moves downward from the World Health Organization’s standard growth curve (5).

**Low birth weight:** Having a birth weight of less than 2500g (6).

**Nutritional transition:** The change in the dietary pattern from a traditional, locally produced diet to a globalized, imported diet which tends to and increases the risk of overweight/obesity (7).

**Overweight:** Having a BMI-for-height Z-score>2 SD in relation to the World Health Organization’s reference population. This indicator mainly reflects a child’s over-nutrition (8).

**Physical violence:** Intentional use of physical force with the potential for causing death, injury or harm (9).

**Sexual violence:** Any kind of harmful or unwanted sexual behavior that is imposed on an individual (9).
**Stunting** (Shortness): Having a height-for-age Z-score<-2 SD in relation to the World Health Organization’s reference population. This indicator mainly reflects failure to reach linear growth potential as a result of suboptimal health and/or nutritional conditions (8, 10).

**Underweight**: Having a weight-for-age Z-score<-2 SD in relation to the World Health Organization’s reference population. This indicator reflects body mass relative to chronological age and can be influenced by both the height of the child (height-for-age) and his or her weight (weight-for-height) (8, 10).

**Wasting** (Thinness): Having a weight-for-height Z-score<-2 SD in relation to the World Health Organization’s reference population. This indicator mainly reflects a severe process of weight loss, which is often associated with acute starvation and/or severe diseases (8, 10).
Introduction

Global burden of child undernutrition
Child undernutrition remains a major public health problem and is responsible for 45% of deaths in children aged under 5 in the world (11). Globally, an estimated 165 million children under 5 years of age are stunted and 52 million are wasted with the highest prevalence located in Sub-Saharan Africa (SSA) and Southern Asia (SA) (12). Undernutrition during early life is associated with childhood mortality and morbidity and higher risk of non-communicable diseases in later life. Furthermore, nutritional deficiencies can limit the mental and physical development of children and negatively affect their later productivity and working capacity (13, 14).

The causes of child undernutrition
According to the UNICEF conceptual framework (Figure 1), inadequate dietary intake and diseases are two immediate causes of childhood undernutrition which manifest at the individual level. In turn, they are influenced by underlying factors manifesting at the household level, including caregiving practices, food security, and access to health care services and a healthy environment. Finally, basic causes of childhood undernutrition manifest at societal level and include environmental, technological and human resources and the way that these are utilized and controlled (15).
Figure 1. UNICEF conceptual framework for the causes of child undernutrition.
(Source: Food and Agriculture Organization, keynote paper: Measuring hunger and malnutrition).

The importance of care

The significance of care, along with food security, a healthy environment and health care services, has been highlighted in the UNICEF framework. “Care” has been defined as the provision of time, attention and support within the household or in the community in order to meet physical, mental and social needs of the growing child and other household members (16). Care manifests in various activities, including feeding practices, particularly breastfeeding (BF) and the feeding of young children, food preparation and storage, hygienic practices, psychosocial stimulation, providing care for the
children during illnesses and care for women, including care for pregnant and lactating women (17).

In circumstances where poverty causes limited access to food and health care services, the importance of care becomes more prominent. In such situations, proper caregiving activities can enhance the use of existing resources to improve health and nutrition, both in women and children (18).

Child care and nutrition during the first years of a child’s life
The first 1000 days of life, from conception to the second birthday, has been recognized as being a critical period for child growth and development. During this period, a child is more susceptible to growth faltering, micronutrient deficiencies and common childhood diseases (19). Results from epidemiological studies have suggested that linear growth faltering that occurs during this period might be irreversible after 2 years of age (20, 21).

Optimal infant and young child feeding practices have been acknowledged as being some of the key aspects of child care as well as important determinants of child growth and development (18, 19). Exclusive breastfeeding (EBF) for 6 months, timely introduction of suitable complementary food and continuation of breastfeeding until the age of 2 or beyond have been recommended ways to promote optimal nutrition and health benefit for children during this period (22).

Breastfeeding
Breastfeeding has been shown to provide numerous health benefits for both infants and mothers. A recent meta-analysis indicated lower incidence of infection and mortality and higher intelligence among children who were breastfed (23). There is also some evidence suggesting that BF might protect children from being overweight and developing diabetes later in life (23, 24).

While practicing EBF for the first 6 months has been recommended for child survival, health, growth and development (25, 26), only 37% of children in low- and middle-income countries are exclusively breastfed and the duration of BF is even lower in high income countries (23). Breastfeeding promotion interventions, including education, counseling and support, are suggested as key components for improving breastfeeding practices (27). Such interventions have been shown to increase the rate of EBF by 90% and reduce the rate of non-breastfeeding by 18% at age 1–5 months (28).
**Complementary Feeding**

Complementary feeding refers to the introduction of safe and highly nutritious food in addition to breast milk at the age of 6 months until 24 months (29, 30). The period of complementary feeding coincides with the time of peak incidence of childhood malnutrition and growth faltering (21, 31). According to the World Health Organization (WHO), complementary feeding should be timely, adequate, safe and given in an appropriate way (32). Proper complementary feeding interventions have been suggested to be one of the most efficient strategies to promote childhood growth and development during this period (33, 34).

**Women’s status and child undernutrition**

While several determinants of child undernutrition, such as inadequate dietary intake, infectious diseases and lack of proper health services, have previously been recognized, not until recently has the importance of women’s status in relation to child nutrition been considered. It was only when scientific efforts were made to understand the higher prevalence of undernutrition in SA compared to SSA, despite better economic growth and better indicators of food security in SA, that the significance of women’s status was exposed. This phenomenon has been labeled the “Asian enigma” by Ramalingaswami et al (35), and, in trying to explain these differences, they identified that lower women’s status and disempowerment in Asia is one of the main contributors to child undernutrition in the region. They suggested that the promotion of equal freedom, opportunities and rights – including rights in decision making participation – within and outside the household is necessary in order to reduce child undernutrition (35).

**Definition of women’s status**

Women’s status is a complex term and no consensus has yet been reached on a standard definition of one’s status. The term has been used interchangeably and in association with “empowerment”, “equality”, “agency” and “power”. Women’s status refers to women’s overall position in society, which can affect their authority, rights and privileges (36). This status can be gained through birth, increasing age, education, economic position and adherence to the expected behaviors (37).

Smith et al defined women’s status as “women’s power relative to men’s in the households, communities, and nations in which they live” (36). They
noted three important aspects regarding this definition: first, women’s status is always considered relative to the status of men rather than being absolute or relative to the other women; second, it is based on their power and ability to make choices; and third, this definition has both intra-household and extra-household dimensions (36).

Pathways between women’s status and child nutrition

Women’s status is a multidimensional concept and it can affect different domains of their lives, therefore, pathways through which women’s status can affect child nutritional status are complex.

Going back to the UNICEF conceptual framework (Figure 1), women’s status can be included as both a basic and/or underlying cause of childhood undernutrition, however, its effects ultimately manifest at the household level and can potentially affect child nutritional status through food security, health environment and, in particular, through women’s caretaking capacities (36).

In the majority of societies women are the primary caretakers of children. In order to provide effective care they require certain resources, such as: appropriate education, knowledge and beliefs; good physical health and nutritional status; good mental health, including self-confidence and lack of stress and depression; autonomy and control over resources; a reasonable workload and adequate time; and social support (17). The ability of women to provide proper care ultimately depends on their access to and usage of these resources as well as the quality of care that they themselves received.

Women with lower status might be more likely to experience domestic violence (DV), have little social support and limited access to and control over household resources, and tighter time constraint (36, 38). They also might have stricter constraints on their freedom of movement and, subsequently, limited access to health care services and information (39). Further, they might have poor physical health and nutritional status as well as poor mental health and lower self-esteem and self-confidence (35, 40). These situations can negatively influence the quality of care that the women can receive and/or provide through limiting their access to necessary resources and/or by impairing their mental and physical health, all of which ultimately affect their pregnancy outcomes as well as the nutritional status of their children (36) (Figure 2).
In this thesis we tried to addresses potential associations between some of these pathways – including women’s exposure to DV, women’s level of autonomy and social support – and their child feeding practices and nutritional status.

Domestic violence

Gender-based DV has been defined as any act of physical aggression, sexual coercion, psychological/emotional abuse and controlling behavior by an intimate/ex-partner or a family member with the intention of inflicting harm or exercising power. In most cases women are victims and the perpetrator is their intimate partner (often referred to as intimate partner violence (IPV)) (41, 42). Globally, 30.0% of women experience physical/sexual IPV during their lifetime. The prevalence is highest in South-East Asia where around 37.7% of women reported having lifetime experience of IPV (42).

Exposure to DV/IPV can bring a broad array of physical and mental health problems to the survivors and can lead to different forms of morbidity and
mortality (43-46). Associations between experience of DV/IPV and women’s symptoms of ill physical health, including injuries, chronic pain, gastrointestinal and gynecological disorders, lower nutritional status as well as mental health problems such as post-traumatic stress disorders (PTSD), emotional distress and suicidal ideation, have been constantly reported (45, 47). Such physical and mental health impairment, along with lower autonomy and less social support due to the controlling behavior that accompanies DV/IPV, may compromise women’s health and pregnancy outcomes (48, 49) as well as caretaking capacities and might also negatively affect their children’s health and development.

Specifically, the negative impacts of DV/IPV on child growth can start during pregnancy. Abused women are more likely to delay or miss prenatal care appointments (50, 51), experience inadequate pregnancy weight gain (52), have sexually transmitted diseases (53) and face pregnancy complications (54, 55). Further, they are more likely to practice risky behaviors such as smoking and substance abuse (50, 56). Impaired maternal health and nutrition as well as engaging in risky behaviors might negatively affect fetal growth and result in low birth weight (LBW), which is a great predictor of poor growth during infancy and childhood (57, 58). Further, stress and psychological trauma associated with experience of violence can disturb women’s hypothalamic-pituitary-adrenocortical (HPA) system and normal regulation of stress hormones such as cortisol (59). This alteration can also lead to fetal growth restriction and LBW by suppressing maternal immune function, inducing uterine artery contraction and decreasing blood flow to the fetus (60, 61).

During infancy, the physical and psychological problems induced by DV/IPV may impair women’s caretaking abilities, including feeding practices, preventive and curative care seeking, and providing the psychological stimulation that the child needs for healthy growth and development (62). Furthermore, social isolation and limited access to health care services might limit women from accessing the knowledge and support that they need for providing proper care to their children.

In a more direct pathway, witnessing violence between parents can affect children’s health and growth by causing a physiological alteration in their stress-response system (63) which can subsequently affect their immune functions (64), metabolic activities and energy release (65). Further, DV/IPV is closely associated with child maltreatment and abuse (66) which can also negatively affect their health and growth (67).
Children of women exposed to DV/IPV are shown to be at higher risk of LBW (68, 69), hospitalization (70), morbidity from diarrheal diseases and pneumonia (71), and mortality (72, 73).

Autonomy

In the same way as status does, autonomy has various definitions. Autonomy has been defined by Dixon as the degree to which women can access and have control over material and social resources within the household, in the community and in society (74). Dyson and Moore defined autonomy as the ability of the woman to obtain information and use that information as the basis to make decisions for themselves or their children (75). This definition has been expanded by Jejeebhoy and Sathar, who defined autonomy as women’s control over their own lives and the extent to which women have an equal voice to their husband’s in matters affecting themselves and their families. Jejeebhoy and Sathar suggested following inter-correlated dimensions for autonomy: knowledge autonomy, including education and exposure to outside world; decision making authority; physical autonomy, including freedom of movement; emotional autonomy, including proper spousal communication and power relations; and economic autonomy, including access to and control over economic resources (76).

Women who possess a greater level of autonomy have better access to and control over household resources, which gives them the opportunity to allocate these resources to maintain and improve the health and nutrition of themselves and their children (38, 77). Further, more autonomous women have more freedom of movement and thus might be more likely to use available health care services for themselves and their children. Moreover, having a higher level of movement freedom may allow women to benefit from interaction with others, exchange information and knowledge as well as receive support from friends and family (78-80).

Despite multiple methods of its measurement, a higher level of women’s autonomy has been positively associated with their Body Mass Index (BMI) (81), fertility-related behaviors (82) and health care utilization (83, 84). Children of women with lower levels of autonomy have been shown to be at a higher risk of LBW (85), under-immunization (86), morbidity from acute respiratory infections (87) and mortality (88, 89).
Social support

Having access to appropriate social support – including assistance in child care as well as informational, material and emotional support – can provide an enabling environment for child health and development by reducing women’s workload, stress and/or lack of resources (17, 90). It has been suggested that having such social support can create a platform for diffusing health-related information and promoting healthy behaviors, increase an individual’s mental and physical health (91, 92) and provide a buffer mechanism to avoid adverse circumstances such as food insecurity (93).

Associations between social support and women’s health-related quality of life (94), mental health (95) and confidence in infant care practices (96) have been documented. Children of women with low levels of social support have been shown to be at higher risk of LBW (97), life-threatening injuries and illnesses (98), impaired general health (99) and mortality (100).

Rationale for this thesis

While low women’s status has been suggested as one of the main contributors to child undernutrition, the specific aspects of women’s status that can affect their caretaking practices and child nutrition have not been fully determined. Given the multidimensional nature of women’s status, understanding pathways through which it can affect child nutrition is crucial for ensuring effective nutritional interventions. Some of these aspects, such as women’s education, have been extensively investigated, however, research evaluating the effects of women’s exposure to DV/IPV, autonomy and social support on their feeding practices and child nutrition are limited and the reported results have been conflicting. Furthermore, although the negative impacts of DV/IPV on women and children have been constantly reported, earlier research has mainly focused on physical and sexual DV/IPV. Considering the fact that emotional violence and controlling behavior are the most frequent forms of DV/IPV, it is important to evaluate the effects of such violence on women’s health and their caregiving capacities. Finally, while breastfeeding counseling has been shown to improve maternal BF practices, the association of such counseling with the duration of EBF among victims of DV/IPV has not been evaluated.

Aims and objectives

The overall aim of this thesis was to assess associations of women’s status with their feeding practices and child nutritional status in two different settings. Specifically, we addressed associations between aspects of women’s
status – including exposure to DV/IPV, autonomy and social support – and their level of stress during pregnancy, child feeding practices and nutritional status in Bangladesh and Nicaragua.

Specific objectives of the study are:

- To evaluate the association of women’s exposure to lifetime IPV with their children’s nutritional status in Bangladesh (Study I);

- To evaluate the associations of women’s autonomy and social support with infant and young child feeding and nutritional status in rural Nicaragua (Study II);

- To evaluate associations of specific and multiple forms of lifetime DV with maternal emotional distress and cortisol level during pregnancy in rural Bangladesh (Study III);

- To evaluate the associations of any or specific forms of lifetime DV with duration of EBF in rural Bangladesh and to determine whether BF counseling modifies the association of experience of any lifetime or specific forms of DV with EBF duration (Study IV).
Methods

Study areas

The studies were conducted in two different areas; Bangladesh and Nicaragua, each of which reflects different cultural contexts. Setting, sample size, exposure and outcomes of the papers in this report are summarized in Table 1.

Bangladesh (Studies I, III and IV)

Bangladesh is located in Southern Asia. With a population of almost 150 million, Bangladesh is one of the most densely populated countries of the world. The majority of the population of this country are Muslims (90%), and the rest are mainly Hindus (101, 102). Over the past decades the country has made significant economic progress with the national poverty level declining from 56.6% between 1991 and 1992 to 31.5% in 2010. Despite this remarkable progress, more than 47 million people are still living below the poverty line in this country (103). While the country has been successful in reducing maternal and children-under-5 mortality, undernutrition among the children remains a great challenge. Thirty-six percent of the children younger than 5 years of age are stunted, 14% are wasted and around 33% are underweight (104). Prevalence of DV/IPV against women is very high in this country and 53% of ever married women reported lifetime experience of physical and/or sexual DV/IPV by their partners (105).

Matlab is a rural sub-district located 57 km southeast of the capital Dhaka. The area consists of more than 140 villages with a total population of more than 220 000. Around 30% of the population has no formal education and agricultural activities and daily labor are the main source of income in this region (106). The area has been a field site for the International Center for Diarrheal Diseases Research, Bangladesh (ICDDR, B). Since 1966, ICDDR, B has maintained a Health and Demographic Surveillance System (HDSS) in the area, recording demographic and selected health information on a monthly basis.
Nicaragua (Study II)

Nicaragua is located in Central America. With a population of around 6 million, Nicaragua is one of the poorest countries in Latin America (LA). Agriculture is the main economic activity in Nicaragua, contributing to 20% of the country’s gross domestic product (107). Despite economic growth in recent years with national poverty declining from 42.5% in 2009 to 26.9% in 2014, the country is still struggling with a high prevalence of poverty, particularly in rural areas (108, 109). While Nicaragua has been successful in reducing mortality in infants and children younger than 5 years of age (110), chronic undernutrition among children remains a challenge. Seventeen percent of children under 5 years of age are stunted (111) and 10% are reportedly anemic (112). In addition, the country is going through a nutrition transition with an overweight prevalence of 55% among adults, of whom 22% are obese (113). The country has male-dominant traditions which has resulted in lower levels of women’s autonomy in the households (114).

Los Cuatro Santos is a mountainous rural province located about 250 km Northwest of the capital, Managua. The area consists of four municipalities; Santo Tomás del Nance, San Juan de Cinco Pinos, San Pedro del Norte and San Francisco del Norte, and has about 25 000 inhabitants in total. Most of the population work in agriculture and agro-industrial activities and the rate of unemployment is high in the region. In 2003, a Health and Demographic Surveillance System (HDSS) covering the whole population was established in the area by a local non-governmental organization called Asociación para el Desarrollo Económico y Social El Espino (APRODESE). So far, four rounds of data collection have been performed in this area.

Study design and study populations

Study I

For Study I we used data from the 2007 Bangladesh Demographic and Health Survey (2007 BDHS), representing the whole population living in private dwelling units in Bangladesh. The 2007 BDHS used a standardized two-stage sampling procedure to select and interview adult members of 10 400 households. The details of sampling design have been presented elsewhere (105). In brief, a team of trained field staff conducted face-to-face interviews with eligible adult members of the households during 24 March to 11 August 2007. Socio-economic characteristics of the household members as well as anthropometric measurements of ever-married women and children younger than 5 years were recorded during the interviews. Within each household one ever-married adult member, either a man or a woman, was selected to answer the IPV questionnaire module (105). All ever-married
women with at least one child under the age of 5 who were interviewed for IPV were included in our study.

Study II

The second study was embedded in 2009 HDSS, which was collected from June to November 2009. For our study, two rounds of data collection were conducted. Within the first round, a group of trained local interviewers visited all households in the HDSS area and collected data on socio-demographic conditions and household food insecurity. All identified households with at least one child below 3 years of age were revisited by a second group of trained interviewers, at which time data were collected on women’s autonomy and social support, as well as infant and young child feeding practices and consumption of highly processed (HP) snacks and sugar-sweetened beverages (SSB), and anthropometric measurements were performed. In cases where there were two children under the age of 3 in the same household, the last born child was selected. All children under 3 years of age who were registered during the first round of data collection and were selected in the second round of data collection and had a complete set of data were included in this study.

Study III and Study IV

Studies III and IV were part of a larger study, the Maternal and Infant Nutrition Intervention, Matlab trial (MINIMat-Trial reg#ISRCTN16581394). MINIMat is a large food and multiple micronutrient supplementation trial of pregnant women in Matlab, which also included a breastfeeding counseling intervention. The study procedure and design have been described elsewhere (115). In brief, during November 2001–October 2003, all women who were identified and confirmed pregnant in the study area were invited to attend the MINIMat study. Enrolled pregnant women (n=4436) were randomly allocated into 2 types of food supplementation and 3 types of micronutrient supplementation regimes in a randomized 2 by 3 factorial design. For the third intervention, at week 30 of pregnancy, 3186 women were randomly assigned to receive either the standard ongoing monthly usual health messages (UHM) or the standard ongoing monthly usual health messages with the additional breastfeeding counseling (BFC). Women were followed up monthly at home by the interview team and revisited at clinics at week 14, 19 and 30 of pregnancy. Through these household/clinic visits, data on women’s socio-demographic characteristics, experience of DV and emotional distress were collected. From June 2003 until March 2004, community health workers visited a sub-sample (n=1300) of pregnant women (week 28–32 of pregnancy) at home and collected their morning salivary samples for
cortisol measurement. After delivery, women were followed up on a month-
ly basis and data on their infant feeding practices were collected.

Table 1- Setting, sample size, exposure and outcomes of four studies included in this thesis

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<th>Study</th>
<th>Settings</th>
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BDHS, Bangladesh Demographic and Health Survey; BF, Breast Feeding; BMI, Body Mass Index; CBF, Continued Breast Feeding; EBF, Exclusive Breastfeeding; DV, Domestic Violence; HAZ, Height-for-Age Z-score; HP, Highly Processed; IPV, Intimate Partner Violence; MAD, Minimum Acceptable Diet; MDD, Minimum Dietary Diversity; MMF, Minimum Meal Frequency; SSB, Sugar-Sweetened-Beverage; WAZ, Weight-for-Age Z-score; WHZ, Weight-for-Height Z-score.
Data collection
In all four studies, the data were collected by trained field staff through in-person interviews and mainly took place at women’s homes. For Studies III and IV, data on DV and emotional distress were collected in private at health care units. All instruments were translated from English to Bengali or Spanish and pilot tested in a similar context and modified before use.

Assessment of exposure and outcomes

Exposures/explanatory variables

Domestic/Intimate Partner Violence (Studies I, III and IV)
A modified version of the conflict tactic scale (CTS) was used to record women’s experience of DV/IPV. The CTS is the most widely used measure of DV/IPV which has been developed and validated by Straus et al (9, 116). The questionnaire is characterized by having direct and behaviorally explicit questions in order to reduce variation in the interpretation and understanding of what violence comprises. The respondents were asked about their experience of specific forms of violence, including physical (Studies I, III and IV), sexual (Studies I, III and IV), emotional (Studies III and IV) DV/IPV and controlling behavior (Studies III and IV). The questions used to record women’s experience of DV are listed in Table 2.
**Table 2. Questions used to document women’s experience of lifetime physical, sexual, emotional DV/IPV and controlling behavior**

**Physical DV/IPV**

*Moderate*
Has your husband or anyone else from your family ever slapped you or threw something at you that could hurt you?
Has your husband or anyone else from your family ever pushed you or shoved you?
Has your husband ever twisted your arm or pulled your hair?¹

*Severe*
Has your husband or anyone else from your family ever hit you with his fist or with something else that could hurt you?
Has your husband or anyone else from your family ever kicked you, dragged you or beat you up?
Has your husband or anyone else from your family ever choked or burnt you on purpose?
Has your husband or anyone else from your family ever used a knife, gun or other weapon against you?

**Sexual DV/IPV**

Has your husband or anyone else from your family ever forced you to have sex or perform any sexual act when you did not want to?

**Emotional DV/IPV**

Has your husband or anyone else from your family ever insulted you or made you feel bad about yourself?
Has your husband or anyone else from your family ever belittled or humiliated you in front of other people?
Has your husband or anyone else from your family ever done things to scare or intimidate you on purpose?
Has your husband or anyone else from your family ever threatened to hurt you or someone you care about?

**Controlling behavior**

Has your husband or anyone else from your family ever tried to restrict your contact with your family of birth?
Has your husband or anyone else from your family ever tried to restrict your contact with your friends and neighbors?
Has your husband or anyone else from your family ever ignored you and treated you indifferently?
Has your husband or anyone else from your family ever got angry if you spoke with another man?
Has your husband or anyone else from your family often been suspicious that you were unfaithful?

¹This question was only used in Study I
Based on women’s answers to the questionnaire, the following binary variables (yes/no) were developed: the experience of any form of DV/IPV including moderate physical violence (Studies III and IV), severe physical violence (Studies III and IV), physical (either moderate or severe) violence (Studies I, III and IV), sexual violence (Studies I, III and IV), emotional violence (Studies III and IV), and controlling behavior (Studies III and IV).

Lifetime experience of any DV/IPV (yes/no) was defined based on women’s experience of one or more acts of violence. The variable “cumulative number of different forms of DV” was created by summing up different forms of DV (i.e., physical, sexual, emotional and controlling behavior) that an individual experienced (Studies III and IV). Study I only included women’s lifetime experience of violence by their husband (IPV). Studies III and IV included women’s lifetime experience of violence by their husband and/or family members (DV).

Women’s level of autonomy (Study II)

Women’s level of autonomy was measured by a constructed seventeen-item questionnaire. Five of the seventeen questions were adapted from the demographic and health survey women’s questionnaire (117). Twelve other questions were elaborated for the study context. The final questionnaire measured different dimensions of women’s autonomy, including financial independence, household-, child-, reproductive and health-related decision making as well as freedom of movement. The answers ranged from values of 1 to 5 with the highest score indicating higher level of autonomy. A continuous score was created for the instrument by summing up women’s responses to the individual questionnaire items. Based on their total score (which ranged from 34–85), women’s level of autonomy was further divided into tertiles of lowest (34–65), middle (66–74) and highest (75–85).

Women’s level of social support (Study II)

Women’s level of social support was measured by a modified version of the Duke-UNC Functional Social Support Questionnaire, and consisted of fifteen questions. The questionnaire measured different dimensions of social support, including confidant (having someone to share and discuss important matters in life), affective (being shown love and caring) and instrumental (such as having help with money during an emergency) (118).

The answers ranged from values of 1 to 5 with the highest score indicating higher level of social support. A continuous score was created for the instrument by summing up women’s responses to the individual questionnaire items. Based on their scores (which ranged from 19–72) women’s level of
social support was further divided into tertiles of lowest (19–36), middle (37–41) and highest (42–72).

**Health and exclusive breastfeeding counseling (Study IV)**

In the MINIMat trial, all enrolled pregnant women with viable fetuses were randomly divided into two groups at around week 30 of pregnancy to receive either the standard ongoing monthly usual health messages (UHM) or the standard ongoing monthly usual health messages with the additional breastfeeding counseling (BFC). The standard ongoing monthly UHM were delivered by ICDDR, B health staff during women’s antenatal clinic visits and included the benefits of breastfeeding, colostrum feeding, the initiation of breastfeeding within one hour after birth as well as the importance of continuing EBF for up to 6 months and timely introduction of complementary feeding with continued BF until the age of 2 years. BFC was provided by recruited local women who had at least 14 years of education and personal experience of BF and who had been given training based on the WHO breastfeeding counseling module (119). BFC included at least 8 visits, starting with 2 visits in the last trimester of pregnancy (30 and 34 weeks), and continuing postnatally with 1 visit from 0 to 7 days after giving birth, and then 5 visits monthly between months 1 and 6 in the participants’ homes. Each visit was typically 20 to 40 minutes in length. The counseling included assessing the position and attachment of the babies during BF, listening to the mothers about their difficulties and providing them with information and practical help when they needed as well as giving them support and building their confidence.

**Measured outcomes**

**Child nutritional status (Studies I and II)**

Nutritional status of children was determined on the basis of their anthropometric characteristics. Based on the WHO child growth standards (8), the following anthropometric outcomes were calculated:

Height-for-Age Z-scores (HAZ) (Studies I and II); this indicator represents linear growth of the children and reflects long-term nutritional status. HAZ <-2 is classified as stunting and reflects chronic undernutrition (8, 10).

Weight-for-height Z-scores (WHZ) (Studies I and II) is a marker of current nutritional status. WHZ<-2 is classified as wasting and reflects mainly recent events such as illnesses and food shortages (8, 10).
Weight-for-Age Z-scores (WAZ) (Studies I and II) is a composite index representing overall nutritional status of the children. WAZ<-2 is classified as underweight and reflects both chronic and/or acute undernutrition (8, 10).

BMI-for-Age Z-score (BAZ) (Study II) is an index used to capture relative adiposity among children (8, 120). BAZ>2 is classified as overweight and reflects over-nutrition.

*Infant and young child feeding practices (Studies II and IV)*

*a) Infant and young child feeding indicators (Study II)*

In Study II, infant and young child feeding practices were assessed by a 24-hour food frequency questionnaire (FFQ) which was developed in accordance with the WHO-recommended key indicators (121-123). The questionnaire consisted of seventy food items, eleven beverages and six of the most common HP snacks and SSB in the study area.

In line with the WHO recommended guidelines (122, 123), the following feeding indicators were developed and used in the study:

Exclusive breastfeeding (EBF): the proportion of infants 0–5 months of age who received only breast milk during the previous day.

Continued breastfeeding (CBF): the proportion of children 12–15 months of age who received breast milk during the previous day.

Minimum dietary diversity (MDD): the proportion of children 6–23 months of age who received food from four or more food groups during the previous day. The following seven food groups have been used for the tabulation of this indicator: grains, roots and tubers; legumes and nuts; dairy products; flesh foods; eggs; vitamin A-rich fruits and vegetables; and other fruits and vegetables.

Minimum meal frequency (MMF): the proportion of breastfed and non-breastfed children 6–23 months of age who received solid, semi-solid or soft foods the minimum number of times or more. Minimum is defined as two times for breastfed infants aged 6–8 months, three times for breastfed children aged 9–23 months and four times for non-breastfed children during the previous day.

Minimum acceptable diet (MAD): the proportion of breastfed children 6–23 months of age who had at least the minimum diet diversity and minimum meal frequency during the previous day, and the proportion of non-breastfed children 6–23 months of age who received at least two milk feedings and
had at least minimum dietary diversity not including milk feeds and the minimum meal frequency during the previous day.

For children older than 24 months, we applied the guidelines for 12–23 month-old children.

*b) Duration of exclusive breastfeeding (Study IV)*

During monthly home visits after delivery, trained female interviewers collected data on women’s infant feeding practices. The data were collected approximately 1–3 days before BF counseling sessions. The mothers were asked to describe their feeding practices during the last 30 days and the data were recorded for 2 separate periods; during the first and last 15 days before the interview. Additional questions were asked to determine whether the infants had been given additional food besides breastmilk, including water, sugar water, other milks, other liquids and semi-solid or solid food. Based on the WHO definition of EBF (123), women were considered to be exclusively breastfeeding if they were giving only breast milk to the infant, with the exception of oral rehydration solution, liquid medicines and vitamins.

*Women’s mental health and stress (Study III)*

*a) Women’s level of emotional distress*

During week 30 of pregnancy, women’s level of emotional distress was measured using a self-reported questionnaire (SRQ-20). The instrument was developed by the WHO to screen for common mental health symptoms, including depression, anxiety and psychosomatic problems, especially in developing countries (124). The questionnaire consists of twenty yes/no questions with the maximum score of 20 and a higher score reflecting a higher level of emotional distress. A continuous score was created for the instruments by summing up women’s responses to the individual questionnaire items. Based on previous studies conducted in Bangladesh (125, 126), women with a score of 7 or higher were regarded as being emotionally distressed.

*b) Women’s level of cortisol*

Women’s level of salivary cortisol was measured during week 28–32 of pregnancy. A field worker visited each participant in their home between 7 and 8 am (approximately 30 minutes to 1 hour after awakening) and one salivary sample was collected from each woman. Participants were given a cylindrical cotton swab to chew on for 30–45 seconds or until it was fully saturated and the field workers placed these in a test tube sealed with a cap. Collected samples were frozen and stored at -20°C on the same day. The concentration of cortisol was further analyzed by using solid phase I radio-immunoassay by the laboratory of Dirk Hellhammer, University of Trier, Trier, Germany.
Statistical analyses

All statistical analyses were performed with statistical software packages IBM SPSS Statistics and openEpi. In all studies, descriptive characteristics of the study participants were presented as frequency and percentage for categorical and/or mean and standard deviation (SD) for continuous variable. We used chi-square tests to compare proportions and/or t-tests/analysis of variance (ANOVA) followed by Bonferroni post hoc tests to compare means and evaluate factors associated with selected outcomes. Potential confounders were identified based on previous research and our knowledge of the settings. The identified potential confounders then remained in the final models if they were associated with both exposure and outcome variables ($p<0.10$) and influenced the model parameters. Some potential confounders remained in the models regardless, as they were considered as key predictors. In all of the studies, multi-variate analyses were used to evaluate associations between explanatory variables and selected outcomes.

Study I

Logistic regression models were used to evaluate associations between women’s lifetime exposure to IPV and their under-5 children’s nutritional status. Generalized estimated equations (GEE) were used to account for the cluster sampling design of the study. Final models were adjusted for women’s and their husbands’ educational level, household wealth index and maternal height.

Study II

Logistic regression for binary (feeding practices) and general linear model for continuous (children’s nutritional status) outcomes were used to estimate associations with maternal autonomy/social support. All models were adjusted for municipality, housing quality, food insecurity, women’s education, women’s age (years) and child age (months). In order to evaluate the independent effects of social support and autonomy, additional models were created where these two factors were both added to the previously mentioned confounders. To account for differences in feeding and care needs, we evaluated the anthropometric characteristics of the children in two different age strata: below 6 months of age and aged 6 months and above.

Study III

Similar to Study II, logistic regression for binary (emotional distress) and general linear model for continuous (level of cortisol) outcomes were used to estimate associations with women’s lifetime exposure to any or specific forms of DV. All models were adjusted for the women’s age, education and
socio-economic status (SES). Models evaluating level of cortisol were additionally adjusted for women’s BMI.

**Study IV**

In this study, we used Kaplan Meier survival curves and log rank tests to compare duration of EBF by exposure to lifetime DV within each counseling groups. Cox regression models were used to estimate association of exposure to any or specific forms of DV with duration of EBF in each counseling group. Further, the interaction between experience of any or specific DV and counseling groups with duration of EBF was evaluated. All models were adjusted for maternal education, SES and BMI.

**Ethics**

**Study I**

The original survey was conducted in accordance with the WHO ethical and safety guidelines for research on IPV. These included attaining individual informed consent and ensuring privacy and confidentiality in order to protect the safety of both respondents and field staff. Interviewers were all provided with a list of organizations helping women in difficult situations. Because the study was a secondary analysis of BDHS and identifiers of the participants were not available in the dataset, no ethical approval was needed.

**Study II**

The study was conducted in accordance with the World Medical Association Declaration of Helsinki. Mothers were informed about the study and gave their verbal consent before participation. The study protocol was approved by the Biomedical Research Ethics Committee at the University of León in Nicaragua.

**Studies III and IV**

The studies followed WHO ethical and safety guidelines for research on DV. Informed written consent was obtained from participating women at enrollment. Interviews regarding DV were conducted in private by trained paramedics. Women who reported having experience of physical or sexual violence or suicidal ideation or attempt were offered mental health counseling. The study protocol was approved by ethical review committee at the IC-CRD, B.
Results

Study I

Participants’ general characteristics

The study included 2042 women and all of their children aged under 5 years\((n=2480)\). Around 65% of the women were living in rural areas and they were mainly in their mid-20s with a mean age of 26 years. Almost 30% had no formal education and one-third were underweight with BMI<18.5 kg/m\(^2\). More than half of the women (53.4%) reported lifetime experience of physical and/or sexual IPV. Lifetime prevalence of sexual partner violence among women was considerably less than physical (18.4% compared to 49.4%, respectively). In addition, a high prevalence of undernutrition was observed among their children; 44.3% were stunted, 18.4% were wasted and 42% were underweight.

Association between women’s exposure to lifetime IPV and child nutritional status

Having any stunted child was significantly associated with women’s lifetime experience of any physical (OR\(_{adj}\) 1.48; 95% CI: 1.23–1.79), sexual (OR\(_{adj}\) 1.28; 95% CI: 1.02–1.61) and physical and/or sexual (OR\(_{adj}\) 1.51; 95% CI: 1.25–1.84) violence by their partners. No significant association was observed between women’s experience of IPV and their children’s wasting or being underweight.

Study II

Participants’ general characteristics

The study included 1371 mother-child dyads living in Los Cuatro Santos area, rural Nicaragua. The women were mainly in their mid- and late-20s with a mean age of 28 years. The majority of them were housewives (90%) and lived with their husband or partners (87%) and more than 35% had less than 5 years of education. The women’s mean score for autonomy and social
support was 69.3 (SD 9.5, range 34–85) and 39.2 (SD 7.5, range 19–72), respectively.

The children were 0–35 months of age with a mean age of 18 months. Only 34% of children younger than 6 months were exclusively breastfed and among children 6–35 months of age the rate of MAD was relatively low (40%). Around 20% of the children were stunted, 4% wasted and 6% underweight, while 9% were overweight.

Association between women's autonomy and infant and young child feeding and nutritional status

Better BF practices were observed among the women with the lower levels of autonomy. Compared to the women in the highest autonomy tertile, women in the lower tertiles had significantly lower odds of not exclusively breastfeeding (ORadj 0.24; 95% CI: 0.08–0.71), and not continued breastfeeding (ORadj 0.24; 95% CI: 0.07–0.81).

With regard to complementary feeding, women in the middle tertile of autonomy had generally better complementary feeding practices, that is to say, the odds for not meeting minimum meal frequency (ORadj 0.68; 95% CI: 0.50–0.94), dietary diversity (ORadj 0.69; 95% CI: 0.48–0.98) and acceptable diet (ORadj 0.63; 95% CI: 0.46–0.85) were lower among the children of women in this group as compared to the women in the highest tertile. However, children of these women were also more likely to consume HP snacks and/or SSB (ORadj 1.45; 95% CI: 1.02–2.06).

After adjusting for potential confounders, no significant association between women’s level of autonomy and their children’s nutritional status was observed.

Association between women's social support and infant and young child feeding and nutritional status

No significant associations were found between women’s level of social support and the WHO infant and young child feeding indicators. However, children of women with lowest social support were more likely to consume HP snacks and/or SSB (ORadj 1.56; 95% CI: 1.10–2.23).

Better nutritional status was observed among the children aged 6–35 months of women with lowest level of social support. They had significantly higher HAZ (β=0.26; 95% CI: 0.05–0.48) and lower odds of stunting (ORadj 0.63; 95% CI: 0.42–0.93) as compared with the children of women in highest tertile of social support.
Study III and Study IV

Participants’ general characteristics

Studies III and IV were embedded into the MINIMat trial. Study III included 3504 pregnant women and Study IV included the follow-up of enrolled women with singleton live-born infants \(n=2795\). The general characteristics of the participants were similar in both studies. Women were mainly in their mid-20s with a mean age of 26. One-third of the women had no formal education and around 22% were underweight at enrollment with BMI< 18.5 kg/m².

In both studies, 57% of the women reported lifetime experience of DV. Around 21% experience physical, 23% experienced sexual, 28% experienced emotional DV and 37% reported experience of controlling behavior during their lifetime. Thirty-one percent of the women were exposed to more than one form of DV and more than 35% experienced emotional distress at week 30 of pregnancy. In Study III, women’s mean level of cortisol was 9.91±3.56 and, among women who provided salivary samples \(n=1212\), around 23% experienced physical, 23% experienced sexual, 30% experienced emotional DV and 37% reported experience of controlling behavior during their lifetime and 39% experienced emotional distress. In Study IV, the median duration of EBF was 105 days among the study sample and women in the BFC group breastfed considerably longer than the women in the UHM group (135 days vs 60 days, respectively).

Association between women’s exposure to lifetime DV and their emotional distress and cortisol level

We found significant association between any lifetime experience of DV and women’s emotional distress (OR_adj 3.18; 95% CI: 2.72–3.70). All forms of DV (physical, sexual, emotional DV and controlling behavior) were significantly associated with emotional distress and women who experienced emotional DV and controlling behavior had the highest odds of being emotionally distressed. There was a dose-response relationship between the number of forms of violence that the women experienced and their emotional distress and women who experienced all forms were considerably more likely to be distressed.

No significant association was observed between experience of any or specific forms of DV and women’s level of morning salivary cortisol among the study sample. Similarly, we did not find any association between the number of forms of violence and women’s level of salivary cortisol.
Association between women's exposure to lifetime DV and their breastfeeding practices

Experience of DV was significantly associated with lower duration of EBF among women who had not received BF counseling. In UHM groups, women were more likely to cease EBF if they had been exposed to any lifetime violence (HR_{adj} 1.13; 95% CI: 1.01–1.26) or sexual DV (HR_{adj} 1.15; 95% CI: 1.01–1.31). Further, the duration of EBF tended to be shorter among women who experienced lifetime controlling behavior (HR_{adj} 1.10; 95% CI: 0.99–1.23). Among women in the BF counseling group, however, no significant association was found between experience of DV and duration of EBF.
Discussion

The research presented in this thesis showed women’s status to be generally associated with their feeding practices and child nutritional status in two low income settings with different cultural and contextual characteristics: Bangladesh and Nicaragua. This report also highlights that different dimensions of women’s status may associate differently with their feeding practices and child nutritional status and that the strength and direction of these associations may vary by child age, setting and other contextual factors.

Specifically, the results of the investigations revealed that, in Bangladesh, women who experienced lifetime DV/IPV were more likely to report emotional distress during pregnancy, cease EBF before 6 months and have stunted children. In Nicaragua, women’s level of autonomy was associated differently with their feeding practices, that is to say, while women with lower autonomy had better BF practices, women with the middle level of autonomy had more appropriate complementary feeding practices. Further, women with a lower level of social support were less likely to have stunted children.

Discussion on the findings

Women’s exposure to lifetime IPV and child nutritional status

We found women’s lifetime exposure to physical, sexual or physical and/or sexual IPV to be significantly associated with higher odds of having a stunted child. In line with our findings, in a pooled analysis of demographic and health surveys of 29 countries, stunting in children was found to be positively associated with maternal lifetime experience of IPV (127). Similarly, lower height development and higher odds of stunting was also observed among children of women with lifetime experience of DV/IPV in research from Matlab, Bangladesh (128), and Kenya (129), respectively. Further, higher odds of stunting was reported among the children of women with last-year experience of multiple family violence in India (130) and sexual domestic violence in Liberia (131).
There are several potential mechanisms through which DV/IPV can affect a child’s health and growth. DV/IPV may increase the risk of child abuse and maltreatment within the household (132, 133). Furthermore, witnessing violence between parents may increase a child’s stress level and alter his/her biomarkers of stress which, in turn, can negatively affect a child’s metabolic and immune function and ultimately impair his/her growth (64, 65). In a more indirect pathway, DV/IPV may negatively affect a child’s growth through a “spillover” effect by compromising maternal mental and physical health and caretaking capacities (62, 134).

While higher odds of wasting have also been reported in children of women with experience of DV/IPV (130, 135), the association was more evident for stunting in previous research. Considering the repeating pattern of violence (136) and the long-term residual negative consequences it has for both women (45, 137) and children (64), one could expect that the effects of maternal lifetime exposure to violence was more evident in children’s stunting, as it is an indicator for long-term nutritional status and reflects the cumulative impact of negative experiences.

**Women’s autonomy and infant and young child feeding and nutritional status**

The results of this study showed that children of women with the lowest level of autonomy were more likely to be exclusively breastfed and continue to be breastfed. In line with this finding, in a meta-analysis of demographic and health surveys of 36 countries, Smith et al found a negative association between women’s autonomy and duration of BF in all three regions of SSA, SA and LA (36). They found this association to be independent of women’s working status and concluded that women prefer not to BF when they gain higher autonomy. On the other hand, women with a low level of autonomy might have better BF practices because of their limited access to family financial resources and/or freedom of movement.

We found children of women in the middle tertile of autonomy to have the best complementary feeding in Los Cuatro Santos. One potential explanation for this finding might be that having a higher level of autonomy may not always represent a higher level of women’s control over resources, but rather, that they have more responsibilities that they must fulfil. Further, promoting a higher level of women’s autonomy in areas where traditional gender norms dictate women’s dependency on their partner might result in DV/IPV (138, 139) and reduce women’s caretaking capacities. Another possible explanation for this finding is that women in the middle tertile of autonomy may be making decisions jointly with their partners. This might reflect better power structures within the family and result in better child
complementary feeding practices. In line with this explanation, previous research in Nicaragua (140) and Bolivia (141) have reported a positive association between joint decision making among couples and their children’s nutritional status.

No significant association between women’s level of autonomy and child nutritional status was observed in our study. Consistent with this finding, a weaker influence of women’s decision making power on child nutritional status in LA compared to SA and SSA has been reported previously (36, 142). Higher levels of women’s autonomy in LA (36) and lower prevalence of child undernutrition in the region (143) might be possible explanations for these findings.

**Association between women’s social support and infant and young child nutritional status**

We found that children of women with the lowest level of social support are less likely to be stunted. Similarly, a negative association between women’s level of social support and their feeding practices (144) and child’s nutritional status (145, 146) has been reported previously. While the maternal social network can be a valuable arena for providing knowledge and child care skills, social network obligations and responsibilities might detract from women’s caretaking capacities and negatively affect their children’s nutritional status. Further, it has been suggested that the characteristics of the social network might be more important for child health and nutrition, that is to say, in a network where members have limited knowledge and education, mothers might be exposed to “wrong” ideas and suggestions which can also negatively affect their caretaking practices (144, 147).

**Association between women’s exposure to lifetime DV and their emotional distress and cortisol level**

The results from Study III revealed that women who experienced any DV in their life were more likely to report emotional distress. Further, all forms of DV (physical, sexual, emotional and controlling behavior) were significantly associated with higher levels of emotional distress among these women. The association between experience of DV/IPV and women’s symptoms of emotional distress and common mental disorders has been reported previously (45, 148-150).

Notably, we found that women who experienced either emotional DV or controlling behavior were more likely to report emotional distress as compared to any physical and sexual DV. While research evaluating the effect of emotional DV and controlling behavior on women’s mental and physical health is relatively limited, there is some evidence that experience of such
violence is more strongly associated with depression (151), PTSD (151, 152), emotional distress (153, 154) and physical health symptoms (154) as compared to physical and/or sexual DV. The detrimental effects of emotional DV and controlling behavior might be due to the more frequent and pervasive nature of these forms of DV in a relationship (155). Further, it has been suggested that such violence is a more direct attack on women’s sense of self (156); can destroy their autonomy (1); cause them to have higher levels of guilt and shame (152, 157); and can make them feel helpless and hopeless (158).

Another important finding of this study was the dose-response association between the cumulative number of forms of DV and women’s levels of emotional distress. Consistent with this finding, a dose-response relationship between the number of forms of DV/IPV experienced by women and their level of depression, anxiety, PTSD and suicidal ideation has been reported previously (159). One can expect that experience of multiple forms of DV might reflect a more severe and/or more frequent form of DV, which can have a more detrimental effect on women (157, 160).

We did not find any association between women’s experience of DV and their level of morning cortisol. Lack of association between morning cortisol levels and maternal psychological measures of stress in late pregnancy has been reported previously (161-163). It can be possible that a higher level of cortisol during late pregnancy, especially in the mornings when the cortisol level is at its highest peak, does create a “ceiling effect” and may mask cortisol responses to stressors (164).

Association between women’s exposure to lifetime DV and their breastfeeding practices

Results from Study IV showed shorter duration of EBF among women with lifetime experience of DV in the UHM group. Consistent with this finding is the negative association between experience of DV/IPV and women’s BF practices that has been reported previously (165-167). Experience of DV/IPV might negatively affect women’s physical and mental health and may compromise their ability to breastfeed (62). Further, abused women might face the additional challenge of having an un-supporting partner who does not approve of their BF practices (168, 169).

Among all forms of DV we found experience of sexual DV and controlling behavior to be particularly associated with shorter duration of EBF. Women with a history of sexual DV might attach BF with their experience of abuse and experience a sense of shame in a way that affects their BF abilities (170, 171). Further, controlling behavior might restrain women’s access to social
support, health care services and information related to appropriate infant feeding practices, which can ultimately impair their BF practices.

No significant association between experience of DV and duration of EBF was found among women in the BFC group, indicating that the negative effects of DV on BF might be mitigated by one-on-one breastfeeding counseling. Experience of DV may cause women to feel powerless in controlling their life situations. Such feelings of hopelessness and helplessness may undermine their sense of self-efficacy and ultimately manifest in their performance of caretaking activities such as BF (172). Breastfeeding counseling might extend the duration of BF in these women by increasing their self-efficacy and providing them the knowledge and support that they need in order to maintain optimal BF practices (173, 174).

Methodological considerations

External validity

The findings of this thesis might be generalizable to other areas in Bangladesh and Nicaragua as well as other countries in the region with similar culture and settings. While the effects of DV/IPV on women and children might be slightly different based on individual patterns of exposure and life conditions, the general consensus is that DV/IPV is widespread and can bring negative consequences both for women and children’s health and well-being, regardless of their demographic and cultural context.

All studies included in this thesis were population-based with relatively large sample sizes; further, the findings in general were consistent with previous research, which increases the external validity of our findings.

Internal validity and reliability

In all studies, standard procedures and methodologies were used to ensure validity and reliability. All fieldworkers were provided with careful training in relation to interview techniques and data collection methods. The precision and accuracy of the anthropometric measurements (Study II) were evaluated through standardization sessions. In all of the studies, standard questionnaires were used and the questionnaires were pilot tested and modified before use.

Selection bias

In Study I, only one eligible woman or man per household was selected to answer the IPV questionnaire. However, the demographic characteristics of
selected women were not different from the total sample, indicating that the selected women were representative of the entire population of women of reproductive age in the 2007 BDHS (105). In order to provide a representative sample, all children under the age of 3 in Study II and all pregnant women in Studies III and IV were invited to participate. The rate of refusal was relatively low in all four studies (<4%).

In Studies III and IV, where we had more missing data, the main reason for participants being lost to follow-up was fetal losses. Given that exposure to DV/IPV is associated with pregnancy complications and fetal loss (175, 176), we might have missed some of the most vulnerable women in these studies. Further, in Study IV, women who had missing data or were lost to follow-up, generally had lower SES and infants with lower birth weight and therefore they might represent a population with different BF practices. However, considering the relatively small proportion of women who were lost to follow-up in both studies (<12%), it seems unlikely that selection bias would have influenced the reported outcomes to a large extent.

Information bias

a) Under-reporting of DV/IPV

Reporting of lifetime experience of DV/IPV could have been affected by reporting or recall bias and therefore women might have over-reported the violence events. However, due to the fear of social stigma and threat, under-reporting of DV/IPV is more common among abused women (177). In order to reduce under-reporting and increase the validity of such reporting, in all of the studies, in-person interviews were conducted. Interviewers were provided with rigorous training to collect data in a secure, confidential and ethical manner. Women were asked behaviorally-specific questions regarding their experience of violence and were given several opportunities to disclose their experience of DV/IPV within the time of interview. However, women had to answer several questionnaires (Study I) or undergo other procedures, such as blood sampling and ultrasound, at the same time (Studies III and IV), which might have increased the risk of under-reporting among them due to response fatigue and/or physical tiredness. If under-reporting is the case, however, it tends to dilute the associations between DV/IPV and the study outcomes, and this would indicate that the associations between women’s experience of DV/IPV and their emotional distress, BF practices and child’s nutritional status might be stronger than reported.

b) Reporting of feeding practices

In Study II we used the 24-hour FFQ to assess infant and young child feeding practices. The instrument is considered to be a valid tool for evaluating
dietary consumption in epidemiological studies (178) and has been recom-
mended by the WHO to record infant dietary information (123). However, it
may be subject to measurement error due to recall bias and does not include
the amount of food that has been given to the child. Further, because the
questionnaire measures the foods that have been given to the child during the
last 24 hours, it might not accurately reflect usual maternal feeding practices.
Despite these limitations, the instrument has been shown to provide an ac-
ceptable estimate of child dietary intake during the first years of life (179).

In Study IV, women were asked about their BF habits during the last month.
Due to recall and/or social desirability, it is possible that bias was introduced
when women may have over-reported their BF practices, especially in the
BFC group. In order to limit this possibility, the data on maternal BF prac-
tices were collected approximately 1–3 days before BF counseling sessions
and mothers were asked several questions about their feeding practices. Fur-
ther, in a subset of the study population, the accuracy of reported BF practic-
es was confirmed by biological measurements (180).

c) Reporting of emotional distress

In Study III, the questions regarding emotional distress were asked prior to
asking women about their experience of DV, therefore it is unlikely that
women’s reporting of symptoms of emotional distress has been influenced
by their disclosure of violence. While it is possible that women who were
emotionally distressed might have exaggerated their experience of DV, as
we discussed earlier, under-reporting of DV/IPV is more common.

Confounding

In this thesis we tried to include well-known confounding factors that have
been detected by previous studies. However, the possibility of residual con-
founders cannot be excluded.

Causality

Due to the cross-sectional/observational nature of the studies, causal infer-
ence cannot be established. Regarding Studies I, II and IV, there are several
mechanisms and theoretical reasoning suggesting that reported outcomes are
results of abuse rather than the precursor. The consistency of our finding
with other studies, as well as evidence of temporal direction for some of the
outcomes (such as emotional distress), indicates that the possibility of re-
verse causality is unlikely in these studies.
Conclusions and recommendations

The findings of this thesis support the role of women’s status as being of importance in determining their feeding practices and child nutritional status in two different cultural settings; Bangladesh and Nicaragua.

The implication of the results from the studies in Bangladesh is that DV/IPV not only has negative impacts on women’s mental health and well-being, but it also compromises their caretaking activities, such as feeding practices, and brings negative consequences to their children’s nutritional status. Our findings also suggested that BF counseling might reduce the negative association between DV and maternal duration of EBF. Given the overall high prevalence of DV/IPV and its negative impacts, both on women and their children, a greater focus on primary prevention of all forms of DV/IPV and providing support to the victims in the current maternal and child health programs is warranted.

In Nicaragua, lower levels of maternal autonomy and social support were associated with more favorable feeding and nutrition outcomes, such as better BF practices and having children with better HAZ. However, these results might be the reflection of other underlying issues related to child feeding practices and nutritional status, such as cultural and contextual factors rather than casual outcomes. Considering the potential negative association between women’s autonomy and their BF practices, efforts to improve women’s autonomy should be accompanied by efforts to support and promote BF practices in order to ensure optimal results.

In general, while increasing women’s status by itself is an important goal, the findings from this thesis suggest that it might also have an important public health impact on improving child health and nutritional status. Therefore, programs and policies aiming to improve child health and nutrition need to consider the importance of women’s status along with other nutritional interventions in improving child health and growth.
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