8.1 Introduction

The present study attempts to measure the extent to household food security in both quantitative and qualitative perspectives and tries to link with the childhood illness and malnutrition. The study is also keen to understand the household’s participation in food-based safety nets program and role of food based safety nets in household food security with special emphasis of public distribution system.

8.2. Nutritional intakes and nutritional deprivation in rural households

Along with the level of nutritional consumptions, this study explains the sources and availability of this nutrition. In nutritional analysis, it is important to understand the composition of food groups and their available sources to get a proper situation of nutritional intakes at household level. Results indicate that overall nutritional intakes are much lower in the study population than the standard norm of 2400 kcal. Average calorie, protein and fat consumption are 2023 kcal, 51gms, and 21gms per capita per day. Scheduled tribe households are severely deprive, mean calorie intake is much lower (1541kcal) than even minimum required level of calorie (i.e 1800 kcal) as recommended by WHO. Similarly, Hankin et al. (1972) showed that calorie intake were low among tribal population. They are not only deprived in calorie but also in other two nutrients i.e protein and fat. In overall scenario, calorie and fat consumptions are the major concern of nutritional security compared to protein consumption. Average per capita per day protein consumption is little higher than the average level of requirement in the study population. Agricultural labour households, landless families, and households having no livestock consume much lower amount of nutrients than their required level for survival. Further, nutritional requirements are mainly accomplished by few cheap qualities of food groups. More than three-fourth (76 percent) of the total calorie intake and 70 percent of total protein intake at the household are met from cereals only. Similarly, oil is the main source
of fat whereas consumption of actual fat-rich foods such as milk and milk products are significantly negligible especially among poor households. Cereal, roots and tubers, and oil together contribute almost 90 percent of the total calorie intake at household. Contribution of cereals to the total calorie consumption is as high as 80 percent in the lowest MPCE families, indicating that poor families are merely dependent on cereals for maintaining their nutritional level. Accessibility to food is the major worry of nutrition security among poor households. Access to agricultural land increases the accessibility of food but most of the poor households are landless. Hence, they are rely on cheap quality food grains purchased from either market (include PDS) or received from other sources as a compensation of labour wages. On the contrary, economically well-off families are efficient enough to conserve the nutritional security. Access to agricultural land, availability of livestock at household helped to maintain the quality food and nutrition among economically better-off families.

This study attempts to understand the nutritional deprivation at household level and finds out proportion of households, which are below than required level. Traditionally, Planning Commission of India follows 2400 kcal/capita/per day norm as cut-off for nutritional deficiency in rural area. This study evidences that about 84 percent rural households in the sample are deficient according to this calorie norm. But this single cut-off calorie approach is not to seem acceptable to classify a household into nutritionally secure or non-secure. Calorie demand for an individual varies according the age, sex, and occupation status. Logically, household’s calorie demand should vary with the demographic and occupational composition of all members in the household and per capita calorie norm approach ignores this issue. To overcome this problem, household’s calorie requirement is estimated using household specific calorie requirement approach. This is more valid over per capita norm as it is adjusted with age, sex and occupational composition at the household. Based on this approach, the study finds that 72 percent households consume less amount of calorie than their required level, which is about 12 percent points lower than the previous approach. However, 57 percent households consume less amount of protein than the required level and 75 percent consume less amount of fat than their required level. This indicates that nutrition security is really a major concern in this study area. In all the three nutrients, significant proportions of households are deprived. There are two possible reasons; either they are skipping their meal and not getting adequate food, or the foods that they consume are cheap in quality.
and less rich in nutrients. This study shows that households are mainly depend on cheap quality and less nutrients rich foods for their diets. In this study population, particularly in disadvantage households, selections of food items are not depend on the household’s nutritional requirement. Rather than, their choice of food selection merely determined by their economic budget, which often restricts their food selection to cheap and less nutrients rich food. Thus, households may consume adequate quantity of food in their diets but this adequate consumption may not sufficient to meet required nutritional demand due to cheap quality and lack of nutrients in the food. This is the reason that average nutritional intake is lower among not only deprived households but also among large landholding households, service holder households, and economically well-off households as well.

Households are more deficient in fat and calorie consumption than the protein. This indicates low consumption level of fat rich foods such eggs, milk, fruits etc due to their economic constraints to afford fat-rich foods form the market. Maximum of the consumed fat in households are invisible fat that comes from oils, especially from mastered oils and contribution of actual fat-rich foods such as eggs, milk, fruits are very low. Similarly, consumption of cheap quality of food grains make them deprived in calorie consumption. On the other hand protein consumption is little better among households, even among deprived households, in comparison to fat and calorie consumption. Maximum proportion of protein comes from fish and vegetables such as beans, nuts, lentils etc. that mainly come either from home grown sources or collected free from nature. For landless and lowest MPCE class households, fish is the main source of protein as fresh water river is abundant in this study area. Geographically, all the sample villages are located along the Dammodor River. Dammodor River has importance in supplying protein rich food such as fish and snails, which are popular foods to contribute in protein consumption for tribal and low income households.

The present study attempts to explain, at what extent households are deficient in various nutrition. Study shows that average calorie and fat consumption are lower than their required level, 64 kcal/cu/day and 8.4 gms/cu/day lower respectively. But average protein consumption is 66.6 gms/cu/day against its required level of 58.7 gms/cu/day, a higher consumption of eight gms/cu/day. Panikar in 1979, while studying in Kerala, showed that average calorie and fat consumption in the sampled households were lower side than required level but average intake of protein was above the minimum recommended
(Panikar, 1979). He also mentioned that high proportion of protein is derived from animal products, especially fish. Economically poor families are not only deprived in nutrients but their depth of deficiency was significant. A huge differentials are found between highest and lowest MPCE groups in regard to nutritional consumption. Households in lowest MPCE group consume much lower than the required level of nutrition. Fat deficiency in poor households is most alarming compared to other two nutrients. They consume nearly 57 percent less amount of fat than their requirement. Contrary, nutritional consumption in all the three nutrients are much higher than their requirement. Level of nutrition security is so impoverished that more than half of the sample household are deprived in all the three nutrients and only 16 percent households found secure in all three nutrients.

8.3 Household dietary diversity and diets intake

Household’s dietary baskets is filled up with following food groups are cereals, roots and tubers, oil-fat, and sugar-spice etc. Most of the houses show average dietary pattern, which constitute with seven-eight food groups in a day. Though dietary diversity constitute with seven-eight food groups but most of them are very cheap in quality and locally grown foods. On the other hand consumption of expensive and nutrias foods like meat, fruits, eggs, milk and milk products etc are very low because of the low purchasing power capacity as well as lack of availability. Households’ dietary diversity varies significantly with the social and economic strata in the rural households. Food diversity is very low to the families from socially backward classes like Scheduled Tribe (ST) and Scheduled Caste (SC) compared to the General Caste families because of the low level of education, low nutritional knowledge and economical inability. Age of the household head shows a significant positive association with the dietary diversity. This finding is very similar with many other studies (Moon et al., 2002; Moursi et al., 2008; Drescher et al., 2006; Drescher et al., 2007). Educational level is also found significantly associated with dietary diversity. Households’ dietary diversity increases with the highest level of education of the head of the households (Moon et al., 2002; Variyam et al., 1998). It may be that educated people are more concerned about their nutritional balance and diets and hence, dietary diversity will increase in their household. Another important factor is household’s size. Household’s dietary diversity increases with the household’s size (Lee and Brown, 1989). It is expected that larger household consumes a more varied diets. Household’s land holding status plays an important role in determining the dietary diversity. High level of
dietary diversity is found highest to the household, which have largest farm size. Sing et al (2002) also finds that dietary diversity increases with an increase in farm size. Role of occupation in dietary diversity is also found important. Households, where main source of income is ‘service’, show highest level of high dietary diversity. It may be that service holder houses are economically well-to-do and educated which make them capable in access of diversified diets. Dietary diversity in the agricultural houses is better than the houses where main income depends on agricultural labour and other labour. It may be that households who have their own agricultural land might choose a diversified crop to grow and thus their home grown crops increase the food diversity. But others might lack access to diverse food items due to lack of time to purchase or minimum availability far away location from market. Another most important determinants of dietary diversity is income.

Several studies showed a positive association with households dietary diversity and income (Theil and Finke, 1983; Pollack 2001; Rashid et al., 2006). A multi country study by Hoddinott and Yohannes showed that household dietary diversity is closely associated with the household’s per capita consumption, a proxy indicator of income. Our finding also suggests that dietary diversity in the households increases with the increased level of income. Households with highest wealth index shows higher level of dietary diversity compared to the houses belonging to lowest wealth indexed.

Food diversity is an important component of food security and very important in micронutrients point of view. Existing evidence shows that there has been a rise in micronutrient deficiencies in the country over time. This calls for the focus of food security programs to be not only on the consumption of cereals but a diverse food basket. Not only quantity but nutritional aspects of various foods are also important. Though the present National Food Security Bill recognizes the importance of sanitation and hygiene in improving the nutritional outcome of children but it focuses only on the quantity aspect of food security. Hence, there is a need to raise the importance of food diversity in food basket to ensure the proper nutrients for an active and healthy life.

8.4 Household food security and coping strategies

This study examines the coping strategies pattern of the households during the time of food insecurity. How they overcome the situation to ensure the food in the household. Similar to many other studies, this study also proves households adopt some normal
coping mechanisms which are easy to adopt to survive with the food insecurity condition in the initial stage of food insecurity, but coping strategies become harder as food insecurity condition goes worst (Messer1989; Braun and Lorch 1991; Shipton 1990; Chamebers 1989). It has been observed that, in primary stage, household tries to beat the insecurity situation by their behaviour change such as they switch to less expensive food, borrowed food from others and relatives etc. Then, as situation goes hard, they adopt more uncompromising strategies such as, they gather wild and immature food, skip meal for whole day etc. Apart from the behaviour change, households also acquire some mechanisms that help to minimise the income shocks in the households, which have been named as livelihood coping mechanisms. Livelihood coping mechanisms are the long term coping mechanisms that help to minimise the risks of income shocks in the household. Most common livelihood coping strategy adopted by the household is use of past saving cash (95 percent), 94 percent households reduce their spending on other expense and 84 percent household compromise with the health and treatment seeking for household members. This study shows a positive relationship between household food insecurity and severity of coping strategies. Severity of coping strategies increases with the hardness of food insecurity condition.

8.5 Household participation in food-based safety net program and role of public distribution system

The present study investigates the participation of households in food based safety nets programs, with particular reference to PDS, ICDS, Mid-day meal programs etc. Though these programs except PDS are targeted to individuals i.e either children, adolescent girls or mothers but they are one way or another related to the household’s nutritional security. However, present study gives more emphasis on household’s participation in PDS and its role in improving the household’s food security condition. PDS, world largest food subsidy program, particularly aims to improve household’s food security by providing subsidised food to the households, especially to the poor households. The operational structure of the PDS shows that it has keen interest to improve the household’s food security to poor households by providing more subsidised food compared to the non-poor households. This seems to be logical because the poor households are highly prone to be food insecure due to the lack of recourses. Thus, PDS has re-structured and revamped in 1997 and popularly named as Targeted Public Distribution System (TPDS). Today, we
have well-structured and world’s largest food subsidy programme to improve the household’s food security condition among poor. Indeed, household food insecurity and hunger among poor remains as major burden in India, which raises questions on functioning and effectiveness of Public Distribution Systems. It is very much relevant to understand that at what extent the PDS has reached to the poor households to improve their food insecurity condition. Several studies have investigated the performance and effectiveness of PDS shows that performance of PDS is far below from the satisfactory level. Though, few South Indian states like Kerala, Andhra Pradesh, Tamil Nadu and Chhattisgarh in Central India showing better performance in term of PDS performance due to their innovative reforms in centrally issued TPDS. In others part in India the performances are very poor due to mal-functioning of the programme. Long lists have been identified in many researches as reasons of malfunctioning and poor service delivery of PDS programme include poor quality of good, cut-off in quantity, irregular supply, low administrative accountability, leakage in food grains, political involvement and corruptions (Singh, 1991; Venugopal, 1992; Balakrishnan & Bharat, 1997; Indrakanth, 1997; Mooij Jos, 1994; Das, 1993; Mooij, 2001; Tritah, 2003). A study in Bihar shows that open involvement of mafia, rangdars, and purposeful blindness of the bureaucrats is a major reason for disempowering the poor and marginalized families who are the rightful recipients of the services (Mooij, 2001). Similar to the others studies, the present study also evidences of the poor performance of public distribution system in the rural West Bengal. Study shows that almost every households of total sample have ration card and more than 95 percent of them have regular access in the PDS. But off-takes of food grains by households are much bellow than their actual entitlement. Study shows that average actual intake per household is only 15 kg/month against the average estimated entitlement of 28 kg/month in the study population. This entitlement and intake gap is much wider for the AAY households; they get nearly 26 kg of less food grains per month compared to their estimated entitlement whereas this deficient is only 10 kg/month for APL household. It is important to mention here that though govt of India has a specific scheme of Public Distribution System and it has a provision of entitlement of 35 kg of food grains for each AAY households (Balani, 2013) and it is recommended that each states will ensure this entitlement but they are relaxed to provide some more facilities to their beneficiary to improve the food security condition. Thus, Entitlement provisions in terms of quantity and types of commodities, and targeted beneficiaries in many states vary from the central scheme. As example, Chhattisgarh has it’s own Food Security Act, named Chhattisgarh Food Security Act 2012 which enacted in this
state before the National Food Security Act (2013) and entitlement provisions under this act are more universal than the central scheme. Similarly food security scheme in West Bengal is also a modified one. It has special provision for tea garden workers, tribal communities and BPL residents of backward districts as identified by the Directorate of District Distribution, Procurement and Supply (DDPS). As this study collects sample from the Bankura district, a backward district, thus household’s food grain entitlement has been calculated based on the food-grain allocation policy for Bankura district as mentioned by the Directorate of District Distribution, Procurement and Supply (DDPS). Thus, this study does not compare the household’s entitlement in terms of centrally recommended entitlement of food grain (i.e 35 kg/month). Rather, entitlement of food grains in each of the households were estimated based on the food grain allocation policy and adjusted with household’s adult members and types of ration card of the household. Then household’s actual intake was compared with the calculated entitlement to understand that to what extent household is utilizing its PDS quota. Study also shows that overall off-take of wheat is much better than the rice by households but there is differentials by the households. BPL household show better rice off-take compared to wheat off-take but APL and AAY households show better wheat off-take than rice off-take. It happens probably due to food grains allocation differentials to various card holder households. As per the allocation policy, APL households are entitled of limited amount of rice (250 gms/per adult unit/per week) which has no importance for their households. Price of rice for APL household is much higher than the BPL and AAY households and quality is also low. Because of marginal price difference between market and PDS, poor quality, and insufficient entitlement off-take of rice is very low among APL households. Low rice off-take among APL households is mainly due to their own choice. Wheat off-take is better than the rice among APL households because per unit quantity is almost twice than the rice, quality is better than rice, and price is also lower than market. Percent of Off-take to total entitlement for rice among AAY households are much lower than the off-take level of wheat. This low off-take of food-grains substantially contributes in leakage. Households low off-take level do not mean their less capability of buy but they are actually getting lesser amount of food-grains than their entitlement. AAY households are entitled of 2kg rice/week /adult unit, which is much higher than the entitlement of BPL households. Thus, there is more opportunity to cut the quantity form AAY household’s allocation. Unawareness about their entitlement seems as main reason of low food grains off-take from the PDS by households. It has been observed during filed work and also emerges from the qualitative responses that majority of the households do no know what amount of food grains they will be getting because of having a particular type of ration card. Ration dealers are also not in favour to clarify about the quantity of food grains in proper ways
and most of the ration shops (fair price shop) do not maintain proper registers that will show the details of entitlement by ration card. Many times ration dealers give excuse of irregular and insufficient supply of food grains and distribute less quantity of food grains than their regular entitlement, which was already lower than the actual level of entitlement. In this situation, households have to trust on them with no other options and enjoy little amount of food grains. Many times it has been seen that household possessed dual types of cards, say both APL and BPL. For example, if a household have five members then one member may have BPL card and rest four have APL card. Most of the time BPL card is given to one member only and rest are given APL cards. In such cases, households are usually treated as an APL household. Another issue that comes out during field observation is lack of renewal of age in ration card. As per the West Bengal FPS (Fair Price Shop) policy, if an individual is less than 18 years then s/he gets half unit of the allocation and individual is entitled of full unit when s/he reaches at age 18 years. Many times it has been found that though individual is at the age of more than 18 years but they are getting half unit of their entitlement or still treating as a child. However, when I checked the ration card, I found that card was renewed at right time but they were not informed about it and treated as half unit member of the household.

Voice rises, does PDS has any contribution to household’s nutrition and food security? Study shows that PDS remains as one of the important source of food grains in poor households. PDS alone contributes more than half (51 percent) of the total consumed food grains in AAY households and one-fourth (25 percent) in BPL households. On other hand, only 10 percent to total monthly consumed food grains is contributed by PDS in APL households. Thus, we can say that PDS has some contribution in terms of access to food grains among BPL and AAY households. In AAY households, on average only 18 percent of total consumed food grains comes from each of either market or home grown sources, this little proportion indicates lack of ability to access of food from market and home grown sources due to low purchasing power capacity and poor resources. Thus, it is obvious that AAY households would have faced excess burden in gathering household’s required food grains in absence of PDS. Now question arises about role of PDS in ensuring the household’s nutrition security. How far does PDS contribute in household’s calorie requirement or total calorie consumption? Overall, the study shows that PDS contributes only 13 percent in total household’s calorie consumption and 12 percent of the total household’s calorie requirement, which is almost negligible. But it seems that PDS has some contribution in household’s nutrition security among poor household. PDS contributes 37 percent calorie to the total household’s calorie consumption in AAY household but this contribution seems very low among BPL (16 percent) and APL (six percent).
Focus should be given on contribution of PDS on household’s calorie requirement, which is more relevant in household’s nutrition security perspective. Study shows that only 26 percent of total household’s calorie requirement is meeting by PDS in AAY households whereas this contribution among BPL and APL household are 15 percent and seven percent respectively. In terms of household’s nutrition security, PDS is not a major concern for APL households but it has concern on poor households, particularly among AAY households. Average calorie consumptions among poor households are much lower than their calorie requirement, indicates their extent of nutrition deprivation. This nutritional deprivation is highest among AAY households. Poor households, especially AAY households are not efficient enough to improve their nutritional condition due to lack of money and poor resources they have. In AAY households, a little proportion of total consumed food grains come from either market or home grown sources, which shows their inability to afford the food from market and lack of physical resources i.e land. Thus, for household’s food consumption and nutrition security they have to depend on either PDS or other sources such as rice against work.

There are many inconsistencies in the distribution of ration cards. In general, APL card holders are the economically well-off and technically termed as Above Poverty Line. BPL and AAY households are poor where BPL refers Below Poverty Line and AAY households refer to the poorest of the poor households. This study records many exclusions and inclusions in the card distribution. There are many BPL and AAY families who are supposed to be in APL categories. As example, 12 percent in AAY households report that their main source of income is ‘service’. Similarly, two percent among AAY card holder households report to have land more than 2.1 acre and nearly four percent households who possess AAY card actually belong in 4th and higher MPCE quintiles. Inconsistency is also found in distribution of BPL cards. More than 25 percent BPL card holder households possess a land of 2.1 acre and more. Nearly 38 percent of BPL card holder households belong in 4th MPCE group and 20 percent belong in 5th MPCE group. On the other hand, there are many APL card holder households who are supposed to be either BPL or AAY category. For example, 21 percent households who were given APL card are actually landless and 18 percent of APL card holders belong to lowest MPCE group. Logically, these vulnerable households should fall in either BPL or AAY categories but there are categorised as APL households. This exclusion and inclusion is the major problem in achieving the PDS goal. Exclusion could be more dangerous than inclusion in terms of achieving nutrition security through PDS.
Overall, PDS has contribution in improving household’s food and nutrition security but it seeks huge reforms in structure, implementation and operation. Recently, Food Security Act 2013 also addresses this issue in order to effective implementation of the Act. Structural and operational reforms in PDS will minimize the leakage of food grains and maximise the access of food-grains among poor households. Many states in India have proved that structural reforms in PDS have potential to improve its efficiency States such as Chhattisgarh, Andhra Pradesh, Tamil Nadu, Madhya Pradesh, Oddisa have implemented IT based reforms in PDS through digitization of ration card, computerised allocation to FPS, use of GPS, SMS based monitoring etc. These states show better performance in PDS than other states. SMS based monitoring and web-based citizens’ portal in Chhattisgarh is found effective in this state. SMS based monitoring allows monitoring by citizens so they can send and receive SMS alerts (using registered mobile number) during dispatch and arrival of TDPS commodities. A recent article on PDS addresses coupon system in Bihar as a potential effective operational reform in Bihar PDS (Choithani & Pritchard, 2015). Reforms is needed in every stages in PDS flow starting from the displacement of commodities to distribution among beneficiaries. Khera (2011) points out that only ration dealer are not entirely to blame. While discussing with ration dealer, it is found that they are also not satisfied with the PDS structure and face lot of problems in the operation. Low commission, corruptions in higher level, irregular supply of food grains are major problems reported by ration dealers. Commissions paid to dealers are very low and they also have to pay some speed money at every step – getting a license, having the commodities dispatched from godowns. Many times they are also cheated in weight. Khera shows that if the dealer were to run the shop honestly he would make just over Rs 100 per month. So it is also important to address the dealers’ issues as well at the time of reforms.

This study shows higher level of access of households in food based safety net programs, particularly in Public Distribution System and a significant difference among food secure and food insecure households in the access in PDS. Though, access of PDS does not ensure the nutritional security. Present study gives some insights that if PDS is implemented with some reforms it has importance in improving the household nutrition security among poor households. PDS should be more targeted to poor households because non-poor households are not depend in PDS for the food grains due to cheap quality and little quantity whereas poor households desire to utilize maximum of the entitlement. Transparency in PDS may increase by regular social audit and IT based monitoring system. Though, new Food Security Act (2013) calls for reforms to strengthen the TPDS.
8.6 Childhood illness and child malnutrition: association with household food security.

Prevalence of diarrhea and fever are very important from child health perspectives. They are associated with child nutrition, level of anaemia and growth-flattering among children. Studies show that current diarrhea, current fever and a history of diarrhea in the previous seven days are associated with an increased risk of anemia (Semba et al. 2008; Howard et al. 2007). Weisz et al. shows that diarrheal disease and fever are inversely associated with changes in height-for-age z-score, mid-upper arm circumference z-score, and weight-for-age z-score (Weisz et al. 2011). The present study shows that about 12 percent children suffered with diarrhea and 23 percent suffered with fever in the past two weeks period of the survey. Prevalence of fever is higher among children compared to the prevalence of diarrhea because the study was conducted during the winter season and research evidences that fever prevalence increases slightly in the cool season (Soenarto, et al., 2009). Prevalence of diarrhea and fever among children are significantly higher in the lower age groups. Other studies also find that younger children are more likely to suffer with diarrhea and fever in compared to older children (Semba et al. 2008; Mihrete et al. 2014; Siziya et al. 2013). A study among under-five children in Odisa shows that prevalence of diarrhea and fever is highest in the age group of ‘6-23 months’ and ’12-23 months’ respectively and lowest prevalence for both these two diseases is found in the age group of ’48-59 months’ (Elizabeth & Raj, 2012). Younger children are more susceptible in diarrheal infection and fever due to their immature immune system and immune deficiency to resistance against bacterial infections, which occur from the contaminated food or drinks. Furthermore, younger children are more likely to be infected with the rotavirus, a common cause of diarrhea in infants (Soenarto, et al., 2009). The study reveals that prevalence of diarrhea and fever among children are positively associated with the household food insecurity status. Good child care practices, immunization, household hygiene and sanitation are important factors that determine the childhood illness like diarrhea and fever (Carmo et al., 2011; Msimang, et al., 2013; Choube, et al. 2014). Ghosh et al ‘s (1997) finding identifies five major behavioural and child care practices that determine the childhood diarrhea, include bottle feeding, non-use of soap for cleaning feeding container, water storage in wide-mouthed container, use of pond water for the same and indiscriminate disposal of children’s stool. Poor knowledge about child care practices among mother is also a cause of childhood diarrhea and fever (Mane et al. 2012)
The present study shows that mother’s knowledge about child care practices and child immunizations vary with household food security status. This study shows that mother’s knowledge and child immunizations are better in the food secure household. For example, nearly 77 percent children in ‘food secure’ households were given ‘colorstum’ milk during first few days after birth while proportions of children given ‘colorstum’ milk in ‘food insecure with hunger’ household were 63 percent. Likewise, 96 percent children received measles, 91 percent were fully immunized and 51 percent were immunized against vitamin A in ‘food secure’ household whereas these proportions were 85 percent, 74 percent and 38 percent respectively in ‘food insecure with hunger’ household. Thus, it is explicable that poor child care knowledge and low utilization of child immunization services by food insecure household are major cause for higher prevalence of diarrhea and fever in these households compared to food secure households. Apart from these, chronic household food insecurity arises due to poverty often restricts the household from access to adequate nutrition, health, purified water, hygienic sanitation (Ajao et al. 2010; Tolossa & Tafesse, 2008; Ellert, et al. 2013), which increase the risks of childhood illness in food insecure household.

This study analyses the child malnutrition in terms of underweight, stunting and wasting among children and aims to link with the household food security status. The study shows that prevalence of underweight, stunting and wasting among children are 41 percent, 51 percent and 22 percent, which are higher than the national average (i.e 42 percent, 48 percent and 20 percent respectively) as per NFHS-3 (NFHS, 2005-07). Similar to other studies in India, this study also finds that most common form malnutrition among under-five children is stunting followed by underweight and wasted (Ratnu, 2013; NFHS, 2005-07; Bhadoria, et al. 2013; Singh, at al. 2006). Higher prevalence of stunting supports the inference that child malnutrition in this population occurred probably due to past or choric inadequacy of nutrition or due to the long term growth faltering. In contrast, underweight indicates disturbances to a combination in linear growth and body proportion whereas wasting indicates acute or recent growth disturbance (WHO, 1995). The present study finds a significant age differentials in prevalence of underweight, stunting and wasting among children. Underweight is highest (56 percent) in the age group of ’24-35’ months and lowest in age group ’12-23’ months. On the other hand, stunting is inversely associated with the age of children while wasting is associated positively. Similar kind of association has been proved in other studies in India (Kamiya, 2011; Bharati, et al. 2010).
In contradiction of many other studies (Habyarimana et al. 2014; Payandeh, et al. 2013; Dasgupta, 1987) the present study shows that there is no significant sex and religion’s differentials in the prevalence of underweight, stunting and wasting among children.

Though this study does not find any significant sex differentials among all the children under-five in their nutritional outcomes but clear gender discrimination is observed in nutritional status with the increase of their age. The study reveals that there is no such gender difference in lower age group (06-23 months) in the prevalence of underweight, stunting and wasting but the gender-gap in the prevalence of these three nutritional indices is wider for the older children (24-59 months). For example, in lower age group 34 percent children in both the sexes were underweight but in older age (24-59 months) the prevalence of underweight for male and female were 43 percent and 51 percent respectively, which indicates that there was no gender-gap in lower ages but in older age, female children were eight percent more underweight than the male children. Similarly for stunting, 70 percent male and 65 percent female were stunted in the lower age (06-23 months) group, had a gender-gap of five percent and favour to female children. On other hand, in older ages (24-59 months), though, altogether prevalence were low but 47 percent female children and 37 percent of male children were stunted which showed a gender-gap of 10 percent and favour to male children. Same is observed in the case of wasting as well, gender-gap increased in upper ages but it showed that male children were more wasted compared to female children in all the ages. It has seen in this study that female children (stunting 65% and wasting 14%) are less malnourished compared to male (stunting, 70% and wasting 16%) in the lower age group (06-23 months), especially in terms of stunting and wasting. Prevalence of underweight also not varies by their sex in lower age; both the sexes show a same prevalence of 34 percent each. But the situation becomes reverse in the older ages among children. Females in older ages are more malnourished (underweight 51% and stunting 47 %) than the male children (underweight 43% and stunting 33 %), especially in terms of underweight and stunting. This again strengthens the argument that the sex difference in the younger ages is a biological phenomenon rather than a social one. Biologically females are stronger than male and they are more resistance to infectious agents (Hill & Upchurch, 1995; Gangadharan & Maitra, 2000; Singh, et al. 2007) which are the reasons that female are less malnourished than their male counterpart in lower age, when gender discrimination is supposed to be absence. At younger ages, children are heavily dependent on breast milk for their nutrition and are unlikely to be competing with
other family members for this food resource (Griffiths et al. 2002), due to their adequate nutrition and biological advantage female children remain healthier than their male counterpart in their younger ages. But gender discrimination plays significant role when child stops breast feeding and competes for a share of family resources (Griffiths et al. 2002). Thus, gender discrimination increases from infancy to childhood or as the child gets older, because of social discrimination rather than biological. The female child is discriminated in many folds including adequate nutrition, health care practices, treatment seeking etc. and results adverse health consequences to them such as malnutrition, illness, morbidity and mortality (Dasgupta, 1987; Sen, 1988; Kishor, 1993; Miller, 1981). The observed higher prevalence of malnutrition among female children in the older ages in this study indicates that female children become victims of grater gender discrimination at their higher ages or their biological advantage diminishes, as they get older.

The present study shows that child malnutrition is significantly and positively associated with the household food insecurity condition. Prevalence of underweight, stunting and wasting increase as household food insecurity condition goes severe. Malnutrition among children is much higher in the ‘food insecure with hunger’ household (underweight 51%, stunting 56%, wasting 28%) compared to the ‘food secure’ household (underweight 23%, stunting 40%, wasting 15%). Results from multivariate analysis show that children from ‘food insecure’ household and ‘food insecure with hunger’ household are 2.5 times and 3.5 times, respectively, more likely to be underweight in compared to children in ‘food secure’ household. Similarly, children from ‘food insecure’ household are 1.6 times more likely to be stunting and 1.5 times more likely to be wasted, whereas children from ‘food insecure with hunger’ household are 1.9 times more likely to be stunting and 2.1 times more likely to be wasting. These findings are consistence with many other studies, which document that household food insecurity is significantly associated with chid malnutrition status (Uz-Zaman, et al. 2015; Baig-Ansari et al. 2006; Kruger et al. 2006; Ajao et al. 2010; Matheson, et al. 2002; Hackett, et al. 2009; Mukhapadhya and Biswas, 2010). Result shows that, when controlled with other exposure variables, household food insecurity status alone has stronger impact on child’s underweight, followed by stunting and wasting. On the other hand, when adjusted with household’s nutritional status, child’s socio-demographic characteristics, mother’s characteristics, participation in nutritional programs, and household’s environment and sanitation, results show that impact of household food insecurity status becomes weaker for underweight, non-significant for
stunting and stronger for wasting. Comparable finding has been reported in other study as well. A study in Bogata, Colombia shows that food insecure children were almost three times as likely to be underweight as food secure children, while stunting is not significantly associated with food security when controlling for covariates (Isanaka, et al. 2007). This findings are not very surprising because underweight (weight-for-age) and wasting (weight-for-height) are the two indicators where ‘weight’ of the child is a parameter and weight may change often due to any recent events such as illness, inadequate diet etc. On the contrary stunting (height-for-age) reflects the long term outcome or chronic malnutrition, which may not be understand using cross sectional study. In this present study household food insecurity is measured using cross sectional data, which reflects food insecurity condition of past one year period, and may not be sufficient for understanding of stunting among children. A longitudinal study could be good to examine the causality in the relationship between household food insecurity and stunting among children. Apparently, other studies, mostly from developed countries, have shown that household food insecurity is associated with the overweight among children (Simpson, et al., 2011; Alaimo, et al. 2001). Though, this relationship has not proved strongly because of inconsistency in results. Alaimo et al. (2001) mentioned that the relationship between household food insecurity and overweight exists only among white girls in US, whereas Oh and Hong (2003) finds a positive relationship between food insecurity and overweight in the Korean children aged 4 to 12 years living in urban area. Another study shows that early gender effects of hunger related to overweight in girls and underweight in boys (McIntyre, et al. 2001). On the other hand, Casey et al. (2001) failed to establish a relationship between food insecurity and overweight in children, even though difference were observed between income levels. The study finds that children in ‘food insecure’ and ‘food insecure with hunger’ households are highly malnourished in comparison to the ‘food secure’ households. Evidences show that household food insecurity is associated with low-income or poverty (Alaimo, 1997; McIntyre, et al. 2000; Rose, et al. 1998) and poverty is further associated with childhood malnutrition (Hong & Mishra, 2006; Hong, 2007; Hong, et al., 2006; Zere & McIntyre, 2003; Doak, et al. 2002). Fundamentally, household food insecurity effects on child malnutrition through a pathway of poverty, inadequate access of food, unhygienic sanitation and poverty, nutritional deficiency, lack of access to vaccinations and basic health care, low level of socio-demographic and economic status of mother etc. There are ample numbers of evidences
show that household food insecurity contributes to the insufficient and irregular supply of food in the household (Matheson et al. 2002), household’s nutritional deficiency (Siwar, et al. 2014), unhygienic sanitation and environment (Tolossa & Tafesse, 2008; Ellert, et al. 2013), low utilization of child health care practices and low socio-economic status of women (Ajao, et al. 2010; Uz-Zaman, et al. 2015), and all of these have association with child’s nutritional status and health. Supporting to these studies, the present study also finds that child immunization and health care utilization are much lower in ‘food insecure’ and ‘food insecure with hunger’ households in comparison to ‘food secure’ households, which could be an explanation of higher malnourishment among children in the ‘food insecure’ and ‘food insecure with hunger’ households.

Results show that household nutrition security is not strongly associated with the child malnutrition. Only household’s protein consumption is found significant with the underweight. Stunting is associated with household’s protein consumption and calorie consumption but stunting is positively associated with the household’s calorie consumption, which indicates that children in calorie sufficient household are more likely to be stunted than the children in calorie deficient household. Though this result is significant statistically but it needs some more logical explanations. Household nutrition deficiency is not significantly associated with the wasting among children. When adjusted with other exposure variables, impact of household’s nutrition security remains unchanged on stunting but in spite of protein consumption, fat consumption become significant on underweight. Studies evidence that food insecurity or nutritional deficiency at household level often not restricts the child’s nutritional intake. Children in nutritionally deficient households are also found nutritionally adequate because other members compromise with their diets in order to ensure the child’s nutritional diets. Casey et al (2001) shows that nutritional intake among children in both the food-insecure and food-sufficient low-income households are same. Consistent with other studies which documented the association of mother’s BMI with child’s nutritional outcomes (Das & Sahoo, 2011; Loaiza, 1997; Teller & Yimar, 2000; Girma & Genebo, 2002; Bhutta, et al., 2008), this study also suggests that children whose mother’s BMI either in ‘normal’ range or ‘more than normal/obese’ are less likely to be underweight, stunting and wasting in comparison to the children whose mothers are ‘thin’. Results from multivariate analysis show that when adjusted with others exposure variables, children from highest MPCE group are 4.4 times and 3.1 times more likely to be underweight ($p=0.004$) and wasting ($p=0.047$)
respectively. Though, uni-variates analysis showing an expected association between household’s MPCE and child malnutrition. This indicates that other confounding factors are more important to determine the child malnutrition rather than household’s MPCE status. However, there need some more logical explanation to support this result. Result shows that children who have not participated in the ICDS program are 53 percent less likely to be underweight. This result again contradicts with many other studies (Jain, 2015; Bhutta, et al., 2008; Bhandari, et al. 2001; Kuusipalo, et al. 2006) which show that nutrition programs have an impact on improving the child nutrition status. However, further analysis finds that food insecure ‘households (77 percent), where children are more in risks to be malnourished, in comparison to food secure households (49 percent) mainly access ICDS services. Again, this study asks mother if her child has received food or supplementary nutrition from ICDS centre at any time in the last one month of period and this question alone does not ensure the regular access to ICDS. Study evidences that supplementary nutrition has benefit only those children who receive it regularly but it has no benefit for those who receive it less often (Jain, 2015). Mukhopadhyya and Biswas (2010) also emphasizes that regular utilization of supplementary nutrition is a protective factor against undernutrition. Other issues that might have linked with this result are quality and quantity of supplementary foods and services that are provided by ICDS centres in this community. Result shows that those who have not participated in ICDS (N=137) among them 46 percent reported ‘poor service quality’ and 47 percent reported ‘malfunctioning of ICDS centre’ as main reason for non-participation. Even in ‘food insecure’ households, more than 90 percent among the non-participants (N=88) reported either ‘poor quality of services’ or ‘malfunctioning of ICDS centre in the community’ as main reason. This indicates the poor performance in the services of ICDS centres in this community. Gragnolati et al. (2005) shows that ICDS program in India, although well-designed and well-placed to address the multidimensional causes of malnutrition, perform far below of expectations. Not only regular access to ICDS centre, but quantity of given food is also important in nutritional point of view, such as, does the quantity of supplementary food sufficient to provide required level of nutrition for the child? It has found while discussing with mothers that quantity of food is not sufficient for all the children.

“Children are provided same quantity of food irrespective of ages but diet requirement varies for the children of different age groups.
Quantity of food given in ICDS may sufficient for younger children but it is not sufficient for the older children. Quality of cooked food is poor and does not contain nutrients rich food” - A mother, 27 years of old.

This statement seems to be important because the ICDS supplementary nutrition program provides 300 calories and 8-10 gms protein for all children from 0 to 72 months. For children 6-23 months of age, this covers 50-150 percent of the required complementary energy needs and 70-100 percent of the recommended protein needs. For children age two, it is supposed to fulfill 20-30 percent of the energy requirements of children and 50-70 percent of their recommended protein needs (Jain, 2015). However, the result from multivariate analysis should not lead us to falsely conclude that ICDS programme has no positive effect on improvement of child malnutrition. Less likely to be underweight among children in those households which have not participated in ICDS program does not actually infer that ICDS programme has negative impact on child health. Rather than, this happens probably due to two reasons: first, less participation of the children who are from ‘food secure’ households and second, absence of positive effect among children who have participated in ICDS (mainly from food insecure household and in high risks of malnutrition) due to poor service delivery. Jain (2015) mentioned that if the ICDS fails to have positive effect on child nutrition status, it is likely due to poor delivery of the program benefits. A growing number of studies evidence (Bhatta, et al., 2008; Bhandari et al. 2001; Kuusipalo, et al. 2006) that if nutritional programme (or ICDS in India) is implemented effectively (i.e ensuring adequate and quality food, regular access, hygiene practices, increasing mother knowledge about child feeding practices etc), it has significant positive impact on improving the child health and wellbeing.

8.7 Policy recommendation

In conclusion, this study suggests following policy recommendations: 

1. Average nutrition consumption, particularly calorie and fat intakes were significantly lower than the required level. Government agricultural policy should not be confined only to increase in production but focus needs to be on the diversification of nutrients rich foods such as horticulture, legumes, and small-scale livestock and fish. Adaptation of new agricultural technologies can increase the diversity and nutritive value of production.
2. Household’s access to livestock has potential to improve the fat consumption level. Government policy should encourage the livestock firming among poor households providing micro insurance credit facility through SHG. This may enhance the coping capacity of women in the household in improving the household food security.

3. This study suggests that PDS should be focused and targeted to the poor only. Corruption, leakage, low awareness among beneficiaries, and low level of off-takes are major reasons for the malfunctioning of PDS. There is urgent need to reform the PDS through IT based reforms system. There is a need to increase the awareness about entitlement among beneficiaries and regular social audit to monitor the PDS. These will minimise the leakage and increase the off-take level.

4. Though 50 percent of the total consumed food grains in AAY households are supplied from PDS but it could meet only one-fourth (26 percent) of the total calorie requirement. Because dietary baskets among poor households are filled with only rice and wheat due to their low purchasing power capacity, which are cheap in quality and less rich in calorie. Only food grains in their diets will not meet their calorie requirement. Thus, PDS should subsidies on other necessary food items such as pulses, eatable oil, and eggs etc, which will not only increase dietary diversity but also improve the calorie consumption among poor households.

5. Study shows that household food insecurity has significant and positive association with child’s underweight, stunting and wasting. Not only child nutritional status but household food insecurity is highly associated with low level of child care practices, low level of immunization, mother’s malnutrition and others proximate variables which are likely to effect on the child malnutrition. Thus this study seeks to improve the household food security condition in order to improve the child malnutrition status in the household.

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