



Nutrition Transition in Sri Lanka: A Diagnosis

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Abstract

It has been widely argued that the increased prevalence of overweight and obesity in Asia is due to the nutrition transition experienced by the region. Most communities in Asian countries have moved away from the monotonous diet to one with more variety comprised of pre-processed food, added sugar and fat, and food of animal origin. The nature and degree of nutrition transition in Sri Lanka however, have not been fully diagnosed. This paper examines the historical trends in dietary patterns and presents recent statistics in relation to malnutrition, dietary diversity, over-nutrition and incidence of non-communicable diseases. Data required for the analysis were extracted from government publications and global databases. The results indicate that there is an emerging trend of people replacing vegetable based foods with animal foods to gain energy, protein and fat. However, the consumption of sugar, salt and alcohol have increased and surpassed the recommended intake posing a threat to health. Thus, it can be concluded that Sri Lanka has been slowly entering the 4th stage of nutrition which is characterized by nutrition related non-communicable diseases. Some poor rural communities though, still suffer from major and micronutrient deficiencies signifying that they are still in the stage of receding famine. The policy perspective calls for immediate attention in diet related interventions in order to prevent the country entering the 4th stage along with curtailing the prevailing under nutrition.

Introduction

Economic Development, urbanization, shift in occupational structure, more women entering the workforce, emergence of processed food companies and recent technology innovation have resulted in changes in food consumption patterns [1-10]. At the initial phase of the above changes, people move away from a monotonous staple diet to a more diverse, high value diet comprised of animal source food, dairy, fruits and vegetables, and fat and oil. This shift enables communities to alleviate macro and micronutrient deficiencies. However, the shift will not terminate there; the diet further evolves and converges to a 'Western diet' which is high in saturated fats, sugar and refined foods, and low in fiber [4]. This diverse high dense diet which is different from the traditional diet together with changing physical activity levels, will later lead to higher occurrences of Non-Communicable Diseases (NCDs). In the literature, this transformation of dietary structure is termed 'nutrition transition' and the process is characterized by five stages: (i) food gathering, (ii) famine, (iii) receding famine, (vi) Non-Communicable diseases, and (v) behavioral change toward a healthy, balanced diet [11]. Despite this classification of distinct phases, due to the diverse nature of the socio-economic conditions of the country, it is possible that different sub-populations in a single country depict different dietary patterns in some occasions. More specifically, a significant fraction of the urban, wealthy population could suffer from obesity while the rural poor suffer from under nutrition [5]. This poses a challenge to policy makers in coming up with a set of food and nutrition policies to address diet related issues in a country.

Over the last 20 years, cereal consumption in many Asian countries, such as China, India, South Korea, and Malaysia have declined and animal food consumption has increased [12-15]. However, as depicted in the literature, this rapid change in many countries is directed towards unhealthy diets with increased consumption of fats and processed foods [12,15]. One exception to this is South Korea, which was able to maintain a low level fat intake despite changing food consumption patterns due to the publicity and education campaigns adopted by the government in emphasizing the health aspects of traditional food [13].

Trends of the associated demographic and socio-economic factors of nutrition transition in Sri Lanka, viz.: income level, female labor force participation rate, urbanization and prevalence of the processed food industry are in favor of a nutrition transition. During the 1963 to 2016 period, there has been a marked increase in the income levels of people. Per capita GDP has increased from 147 US\$ to 3,835 US\$. More women have entered the workforce (the female labor force

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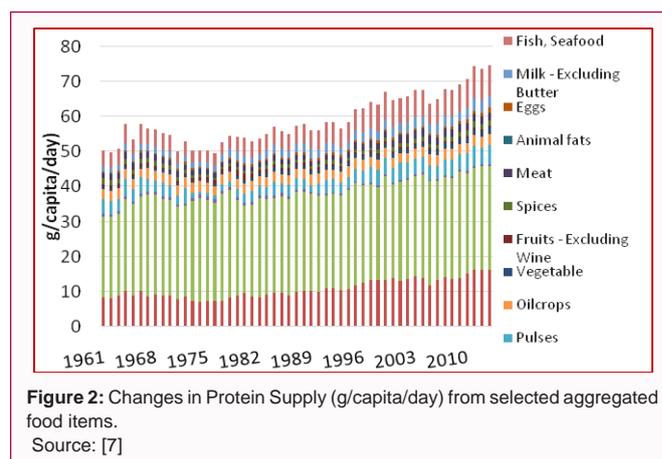
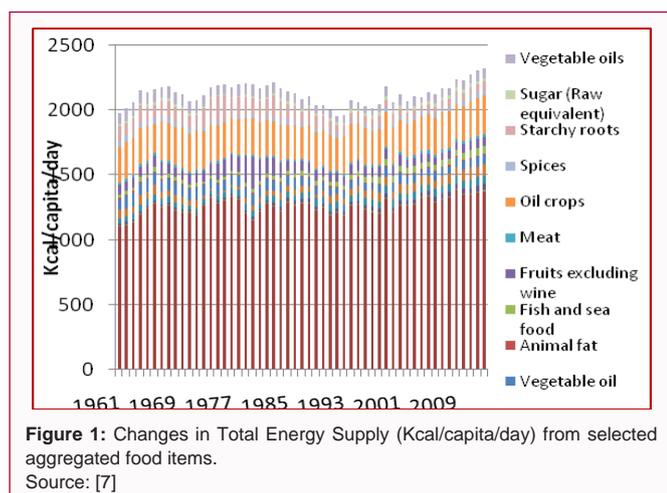
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Table 1: Changes in Food Supply in Sri Lanka by selected years (kg/capita/year).

Food Category	1961	1970	1980	1990	2000	2010	2011	2012	2013
Alcoholic beverages	1.18	1.06	1.03	0.84	1.96	3.64	5.17	6.75	6.51
Sugar crops	7.90	5.46	7.95	17.01	25.31	29.52	18.93	16.88	30.10
Cereals	121.44	139.43	129.5	140.84	137.18	148.08	149.83	152.35	152.26
Eggs	0.92	1.40	1.86	2.45	2.38	2.61	2.72	2.75	4.57
Vegetables	19.70	16.44	25.72	31.28	32.83	38.46	40.34	41.59	46.24
Milk	17.49	20.9	27.72	28.22	32.61	36.07	40.61	39.98	34.98
Pulses	7.17	5.91	4.01	4.88	6.92	8.94	10.03	8.02	9.29
Vegetable oil	3.23	3.94	3.92	2.80	2.66	2.98	2.87	3.46	3.17
Animal fats	0.45	0.37	0.21	0.25	0.24	0.13	0.13	0.13	0.13
Fish	16.43	14.11	14.71	15.16	22.34	24.14	26.08	25.86	25.65
Fruits	38.40	38.21	121.48	37.16	39.54	35.15	36.70	36.61	36.15
Meat	3.97	4.46	3.53	3.17	5.38	6.60	6.34	6.45	6.48
Oil crops	67.07	76.52	67.31	66.67	66.9	63.87	66.95	70.43	72.44
Spices	5.15	3.62	3.25	2.53	3.65	4.65	5.21	4.72	4.61
Starchy roots	30.73	26.27	32.38	22.07	19.03	18.11	19.13	18.52	19.87
Sugar (raw equivalent)	17.60	24.65	17.29	18.47	30.68	28.49	27.03	26.71	26.34



participation rate has improved from 14.2% to 35.9%) [16]. The urban population has grown from 16.4% to 18.4% through 1960 to 2016 and the percentage of people who are employed in the agriculture sector which is labor-intensive has declined from 41.8% to 27.8%. Besides these demographic and socio-economic changes, with globalization, multinational fast food service providers such as Pizza Hut, KFC and McDonald’s entered the Sri Lankan market in the early and late nineties [17] with their outlet snow widespread throughout the country. The changes in household income, women time value and exposure to the processed food industry along with change in occupational structure were conducive in transforming diet composition.

There exists some evidence on the change in food consumption behavior of Sri Lankans. For example, the WHO STEP Wise approach to Surveillance [18] has identified the dietary risk (low level consumption of fruits, vegetables, nuts and seeds and high consumption of sugar and salt) as the leading risk factor of rising Nutrition-Related NCDs (NR-NCDs) in Sri Lanka.

In light of the above, the purpose of this study is to diagnose the

nature and degree of nutrition transition in Sri Lanka. The objectives of the paper are: (i) to examine the changes in dietary patterns to ascertain whether there is a movement towards more animal origin foods, added sugar and fat, and alcohol, and (ii) to examine the incidence of under nutrition, over nutrition, micronutrient deficiencies and Nutrition-related non-communicable diseases.

Methods and Data

The study is purely an explorative research which identifies trends and patterns in food consumption and nutrition. This paper utilizes the food supply data published by the Food and Agriculture Organization (FAO) for the 1960 to 2013 period to explore the change in food consumption patterns. The data include national-level figures on per capita supply of food items/food groups and energy as well as the protein and fat supply derived from each food item/group by the average individual. Once the trends of food consumption were identified, the intake of energy, protein and individual food group were compared against the World Health Organization (WHO) recommended intakes.

The study also used data from various survey years of the Household Income and Expenditure Survey (HIES) and the

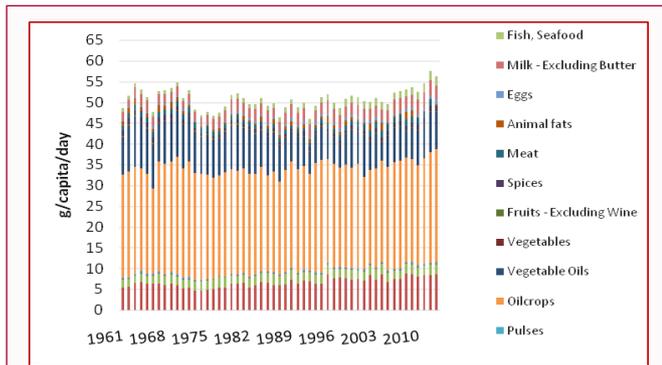


Figure 3: Changes in Fat Supply (g/capita/day) in various aggregated food items. Source: [7]

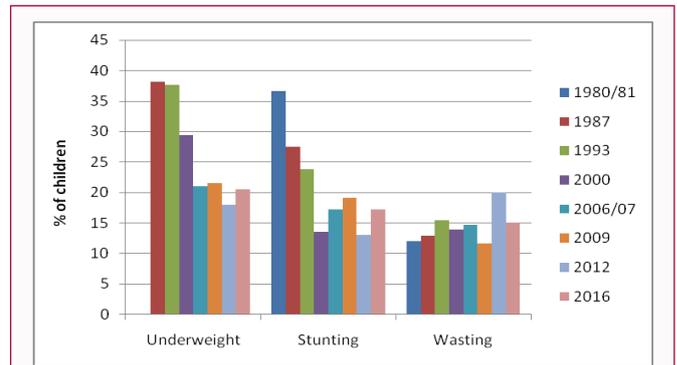


Figure 5: Changes in Underweight, Stunting and Wasting in Sri Lanka. Source: [1;8;10]

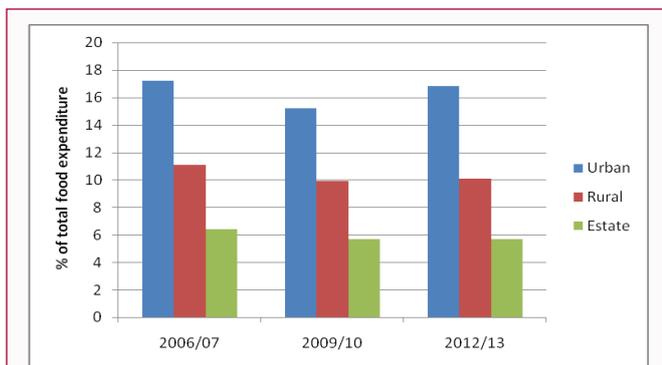


Figure 4: Average monthly household expenditure on prepared foods as a percentage of the total food expenditure by sector. Source: [2]

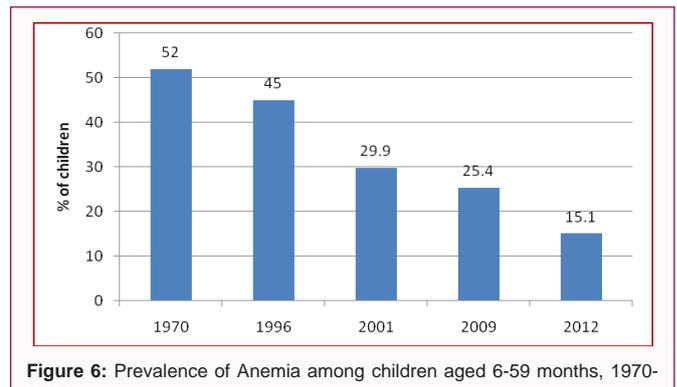


Figure 6: Prevalence of Anemia among children aged 6-59 months, 1970-2012. Source: [8]

Demographic and Health Survey (DHS) to document the change in patterns of malnutrition, under nutrition and micronutrient deficiencies and over nutrition. The trends in the prevalence of diet-related non-communicable diseases were gathered from various years of the Health Bulletin published by the Ministry of Health. [Gaps in data were filled by published literature].

Results and Discussion

Changes in Dietary Patterns in Sri Lanka

Consumption of healthy versus unhealthy food: According to the guidelines for a healthy diet provided by the World Health Organization (WHO), healthy food items are fruits, vegetables, legumes, nuts and whole grains. A healthy diet should contain less than 10% of the total energy intake from free sugars, less than 30% of the total energy intake from fats and less than 5g of salt. The trends in consumption of healthy versus unhealthy foods cited above were examined using data reported in the FAOSTAT for the 1961-2013 periods (Figure 1).

Per capita fruit and vegetable supplies in Sri Lanka were approximately 100g and 127g per capita per day respectively by 2013 [19]. To get an insight on the adequacy of the fruit and vegetable intake, we compared the actual food supply figures with the WHO recommended intake of at least 400g of fruits and vegetables per day per capita during the 1961-2013 period. Accordingly, we found that Sri Lankan consumers have never met the recommended minimum intake of fruit and vegetable except for one year (1980) during the reference period. More specifically, the per capita supply of vegetable and fruit (225g per capita per day in 2013) is only slightly higher than

half the recommended intake level. However, the good news is that there is now an increasing trend in the consumption of fruits and vegetables since the 1990s (Figure 2).

Per capita availability of pulses, which is a less expensive source of protein, is 25g per capita per day in 2013. Compared to 1960 which recorded a consumption of 20g per capita per day, this is a slight increase. Nut consumption also has increased from 1.15g per capita per day from 1961 to 2.84g per capita per day in 2013. With increased consumption of both pulses and nuts, the gap between the per capita supply of pulses and nuts, and the WHO recommended level (30g per capita per day) has been narrowing over the years.

Per capita availability of animal-sourced food has also improved significantly in Sri Lanka. During the 1961-2013 period, the consumption of egg, fish, meat, and milk products has grown. Per capita fish consumption shows a tremendous increase of 45g per day in 1961 to 70g per day in 2013. In addition, per capita daily egg consumption has increased from 2.5g in 1961 to 12g in 2013. Per capita daily meat and milk consumption also rose from 11g to 18g and 48g to 96g respectively during the same period.

Sugar consumption by an average Sri Lankan has seen a twofold increase within five decades which is an unhealthy sign. Having been 48.21g per capita per day (178 Kcal/capita/day) in 1961, it has risen to 72.14g of sugar per day (266 Kcal/capita/day) in 2013. As a percentage, energy intake from sugar was 2.32% of the total energy intake in 1961 and the respective figure in 2013 is 10.47%. With this massive increase, per capita intake of sugar has surpassed the WHO recommend level (below 10% of energy intake from sugar).

In the absence of a continued series of data on per capita

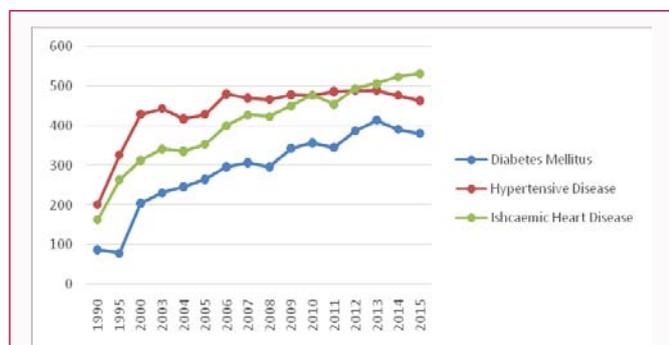


Figure 7: Hospitalization due to selected NCDs in Sri Lanka, numbers per 100,000. Source: [18;19]

availability of salt, we extract figures from journal articles to observe the changing dietary patterns of salt. Consequently, we noted that salt consumption has increased from 7g per day in 1970 to 9g to 11g per day in 2012 [20,21]. This is much higher than the WHO recommended intake of 5g per day.

Apart from the surge in sugar and salt consumption per capita, alcohol consumption too has increased over the reference period (1961 to 2013) (Table 1). Having been approximately 2-3g per day per capita from 1961 to 1997, it has escalated to a staggering 17.84g per day per capita by 2013.

Intake of nutrients and sources of nutrients: As seen from Figure 1, the per capita total energy consumption has been continuously increasing over the decades from 2,074 kcals in 1961 to 2,539 kcals in 2013. This increase has narrowed down the food deficit from 262 kcal per capita per day to 195 kcal per capita per day [19].

As in most Asian countries, cereals are the main source of energy in Sri Lanka, accounting for little more than half of the total energy intake in the country. This significance has not changed over the years. Conversely, the contribution to energy from starchy tuber crops, vegetable oil, oil crops, fruits, spices and animal fat has decreased

slightly through the years. This decline has been offset by the energy contribution from milk and fish. The contribution of animal food to total energy particularly, has increased from 4.68% to 17.24% during the 1961-2013 periods. Among animal foods, more energy is derived from milk, fish and seafood while oil crops and sugar contribute 12% and 10% respectively in 2013.

Protein and fat supply have also increased from 43g to 60g and 43g to 50g respectively during the 1961-2013 periods [19]. The main source of protein in Sri Lanka is again cereals. More than half the intake comes from cereals and the contribution over the years has declined by 4%. The increase in protein intake is mainly fueled by animal products. During the reference period, contribution from animal food to total protein intake has nearly doubled. Contribution from pulses also has improved marginally.

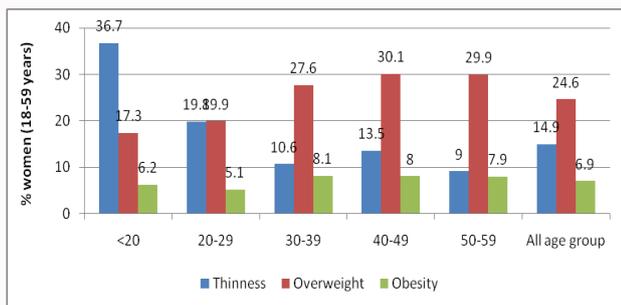
With respect to fat supply, the daily per capita in Sri Lanka is mainly derived from oil crops which contribute nearly 56% followed by vegetable oils (18%). Through the years, contribution from animal sources too has expanded from 12.5% in 1961 to 17% in 2013. However, the animal fat consumption is less than 1% in recent years (Figure 3). Considering food consumption away from home, with globalization and trade liberalization, exposure to processed food high in energy, sugar, salt, and fat has increased in Sri Lanka [22]. As a result, approximately 27% of adults in Sri Lanka always or often consume processed foods which are high in salt [16]. On average, men consume two meals which are prepared outside the home. The away from home food consumption is relatively higher among the 18-29 age group [16]. As depicted in Figure 4, there is a geographic disparity in the share of food expenditure on prepared food i.e., food away from home. Out of the total food expenditure, urban dwellers spent 18% on prepared food in 2013. The figure for rural and estate dwellers are 10% and nearly 6% respectively in the same year. In view of the changing consumption patterns of food prepared outside, there is only a marginal increase in the expenditure share on prepared foods.

Dietary diversity: With increase in income, food share of the

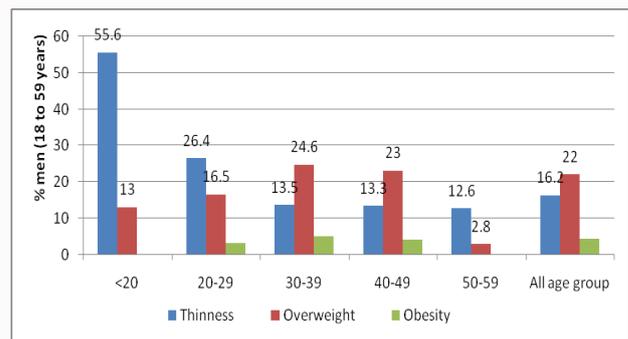
Annex 1: Average monthly household expenditure shares on selected food items (%).

Food item	1980/81	1985/86	1990/91	1995/96	2002	2005	2006/07	2009/10	2012/13	2016
Rice	31.5	25.3	25.7	21.2	18.0	13.8	13.9	17.3	13.6	12.8
Wheat flour	2.4	2.6	1.5	1.1	1.2	1.2	1.1	1.4	1.3	1.0
Bread	4.7	5.3	4.5	4.4	4.3	3.6	3.5	3.2	3.0	2.4
condiments	8.0	9.8	10.6	9.9	9.1	9.0	9.3	9.1	9.0	9.8
Pulses	NA	3.6	4.8	3.7	3.2	3.4	3.5	4.1	3.5	3.6
vegetables	7.5	9.9	9.9	8.3	7.9	8.1	8.4	7.6	8.2	8.0
Coconut	8.2	5.9	5.5	6.9	7.3	5.6	5.5	5.6	6.1	5.7
Meat	NA	2.6	3.4	4.4	3.2	4.4	4.2	3.9	4.3	4.8
Fish	4.9	5.9	5.8	6.6	6.3	8.5	8.6	8.8	9.1	9.5
Dried fish	3.2	4.0	4.2	4.6	3.7	3.8	4.0	3.7	4.2	4.0
Milk and milk products	3.3	4.3	5.1	7.1	8.4	9.9	8.7	7.8	8.9	8.2
Egg	NA	0.9	1.1	1.1	0.8	1.0	1.0	1.0	1.0	1.1
Fruit	NA	1.2	1.3	1.7	3.6	3.9	3.4	2.9	2.9	3.2
Sugar	7.8	6.3	6.5	5.2	3.3	3.3	3.6	3.4	2.9	2.2
other food and drinks	18.5	12.4	10.1	13.8	19.6	20.5	21.3	20.2	21.8	23.7
Total	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.0	99.8	100.0

Source: [2]



Annex 2: Prevalence of Thinness, overweight and obesity among women 18-59 years of age (n=3019). Source: [8]



Annex 3: Prevalence of Thinness, overweight and obesity among men 18-59 years of age (n=3019). Source: [8]

people has reduced from 60% in 1953 to 32% in 2013 [23]. Over these years, share of expenditure on rice has declined from 31.5% in 1981 to 13.6% in 2016 (Annex 1). In contrast, household expenditure share on fish has increased from 4.9% in 1981 to 9.1% by 2016, while the share of spending on milk has risen, from 3.3% in 1981 to 8.9% in 2016 (Figure 5). This indicates that our diet has become richer with animal foods when compared to the past. However, dietary diversity is still low among Sri Lankans. Although people consume adequate servings of cereal in terms of dairy, the vegetable and fruit intake is low [11]. According to, only 76.4%, 75.5% and 46.6% of the urban, rural and estate sector children aged between 6-23 months respectively meet the minimum dietary diversity [10,24]. Similarly, states that nearly 70% of adults in Sri Lanka take excess starch in their food [25].

Under nutrition and micronutrient deficiencies

While per capita availability of food has increased over the years, the existence of malnutrition has not been adequately curtailed. According to the Demographic & Health Survey (DHS) 2016 data, among children under 5 years of age, 20.5% are underweight (compared to the 18% revealed by DHS in 2012), 17% are stunted and about 15.1% under 5 are wasted (in contrast to 14% in 2000). As for many indicators, malnutrition as measured by anthropometric indicators is high in poorer rural areas. Although food intake is only one determinant of anthropometric measures, its significance cannot be overlooked. One of the other main diet related health conditions in Sri Lanka is anemia. According to the recent Micronutrient Survey in 2012, of the total sample of children, 15.1% were anemic while its existence is associated with low income and low wealth families. The prevalence is highest among children aged between 6-11 months old (34%) [26]. Moreover, it has been revealed that roughly one third of Sri Lankan women are anemic (32.6 %) in 2016. The prevalence of anemia was 35.4% among pregnant women, 32.5% among non-pregnant women [27]. The other common micronutrient deficiencies are Zinc, Vitamin A and Calcium. Studies carried out in some areas revealed that micronutrient deficiencies are higher in some poorer rural regions.

Overweight, Obesity, and Nutrition-related Non-Communicable Diseases (NR-NCDs)

According to [5], the fourth stage of nutrition transition is NR-NCD. During this phase, people consume a diet high in total fat, cholesterol, sugar, and other refined carbohydrates and low in polyunsaturated fatty acids and fiber. This unhealthy diet together with an increasingly sedentary life will result in a high level of obesity and later high incidence of NCDs (Figure 6).

Overweight and obesity: Previously presented FAO statistics on per capita availability of sugar, salt and alcohol provide some evidence on the occurrence of this stage in Sri Lankan society. One of the key risk factors of nutrition-related NCD is obesity and overweight and it has been found that approximately 29% of adults were either overweight or obese (BMI ≥ 25 [18]).Overweight and obesity among Sri Lankans is positively associated with urban living, education levels and income of the people [28]. In terms of the prevalence of overweight and obesity among adolescents, overweight is higher in school children from urban areas [29]. This contrasts with the prevalence of stunting and underweight, where the occurrence is higher in school children in rural areas than in urban areas.

Nearly five percent of children aged 5-19 years are obese [30]. When comparing this figure (4.8%) against the respective figure in the past and against other countries in the region, it urges immediate attention. In fact, in 1975, only 0.1% of the children aged 5-19 were obese and in the region, the prevalence of obesity is highest in Sri Lanka next to the Maldives [30]. According to DHS 2016, 1% of pre-school children are obese [31].

Of the women aged 15-49 years who had a child under 5 years and not pregnant at the time of the survey, 17.0% had a BMI less than 18.5 (thin), 22.8% with values between 25 and 29 (overweight) and 6.6% with BMI values at 30 or above (obese). Looking at the factors associated with the prevalence of underweight and overweight, more women tend to be overweight than men (Annex 2 and 3) and elderly people are more likely to be underweight. While women in the age group of 40-59 tend to be overweight, women less than 20 years old tend to be thin (Annex 2). Aggravating this further situation of dietary risk, 22.5% of males and 38.4% of females in Sri Lanka do not follow the WHO recommendation of physical activity. Surprisingly, women in the age group of 18-29 are more physically inactive compared to other age categories, excluding 60-69 [18]. Similar to the change in food consumption patterns in which people have partly moved towards unhealthy food, the proportion of people who are physically inactive has also increased over the years [32-35]. This variation could be a result of the changing nature of the activity people are engaged in, the mode of transport used as well as entertainment activities people choose. As revealed in another survey, approximately 30% of the school children surveyed spend more than two hours for watching television and roughly 20% do not engage in physical play activity [29].

Nutrition Related NCDs: Reflecting this rise in risk factors associated with changing dietary patterns and physical activity, the

burden of NCDs in Sri Lanka has arrived at a stage where it requires immediate rectification (Figure 7). Nearly 70% of the disease burden in Sri Lanka is due to non-communicable diseases while 80% of the deaths are due to NCDs. This is the highest in the South Asian region (India: 61%, Bangladesh: 67%, Nepal: 65%, Pakistan: 57%, Maldives: 78%, Afghanistan: 42%). Out of all the deaths due to NCDs, about 40% are due to cardiovascular diseases and 7% due to diabetes. According to the WHO in 1980, under 5% of the population alone had diabetes and by 2014 it had escalated up to 8% [36-38].

Further, one fourth of adults have either raised cholesterol levels or are on medication (>190). It was found that the mean total cholesterol and LDL-cholesterol levels in the population were at 203mg/dl and 133mg/dl respectively, with levels significantly higher in females than in males [39].

Conclusions

Data on food availability, physical activity and research findings provide ample evidence on the shift in diet and activity patterns of Sri Lankans. In summary, energy, protein and fat intake of Sri Lankans have increased over the years. Composition of the food basket too has changed from the past wherein contribution of animal food to total energy and protein has risen. These changes are favorable and may have contributed to the declining trends of malnutrition in Sri Lanka. However, not all changes in consumption are favorable. Compared to the past, people now consume more sugar, salt and alcohol.

Simultaneous occurrences of these favorable and unfavorable changes of dietary patterns and physical activity create an ambiguity as to where Sri Lanka stands in the stages of nutrition transition. Similarly, both under nutrition together with micronutrient deficiency, and over nutrition exist in Sri Lankan Society. This triple-burden also creates uncertainty in Sri Lanka's position in nutrition transition. On the one hand, it is at the third stage where we are moving away from malnutrition while on the other it is in the fourth stage where NR-NCD and obesity is increasing. However, as previously mentioned, Sri Lanka is not the only country which faces this triple-burden. This is a common phenomenon in countries in transition. The implication of this is beside the country-wide programs and policies that are implemented in a country to combat malnutrition, as well as over nutrition, country is still suffering from dual burden of malnutrition and over-nutrition. This could be mitigated by formulating food strategies in a way that the people's food security is enhanced through adequate consumption of safe and good quality food so that both burdens will be addressed through one policy. Specifically, interventions are required to curtail the high consumption levels of sugar, salt and alcohol through proper regulatory measures on the fast and processed food industry. In the meantime, different interventions are required to further escalate the consumption of fruits, vegetables and nuts. Gaps in knowledge with respect to the nutritional benefits of these products and market inefficiencies which result in higher prices or low availability need to be additionally tackled.

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