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Dietary Sodium and Hypertension Status: A Quantitative Study Exploring Older Adults' Food Purchasing and Consumption Behaviour

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A thesis submitted in partial fulfillment of the requirements for the Master of Science degree in Health and Rehabilitation Sciences

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ABSTRACT

Objectives: The purpose of the study was to investigate the relation between hypertension (HTN) status and the amount of sodium purchased and consumed by community dwelling older adults. The secondary objective was to compare their adherence with the DASH dietary pattern according to hypertension status.

Method: A dietary survey of 30 community dwelling older adults was conducted. The amount of daily sodium purchased and consumed, DASH score and DASH adherence were compared between the hypertensive and normotensive older adults using grocery receipts and 24-hour dietary recall. Participants' knowledge, concern and behaviour regarding dietary sodium were also assessed using a researcher administered study questionnaire.

Result: There was no significant difference in both the amount of sodium purchased ($p = 0.07$) and consumed ($p = 0.61$) by the older adults with and without hypertension. Older adults with HTN had significantly lower DASH scores (DASH score = 1.8) than those without HTN (DASH score = 4.3) ($p < 0.001$), with only 6.3% of HTN adults considered as DASH accordant. Participants' knowledge and concern regarding dietary sodium did not show any meaningful relationship with the amount of sodium purchased and consumed.

Conclusion: This study implied a need for more established guidelines regarding reduction of sodium content of processed, pre-packaged and restaurants foods in the Canadian food supply. The need for further involvement of health professionals regarding dietary modification to prevent and manage hypertension in addition to greater public health efforts is also apparent from the findings of the study.

Keywords: *Hypertension, dietary sodium, purchasing behaviour, consumption behaviour, knowledge, older adults, DASH diet*

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CHAPTER 1

INTRODUCTION

Hypertension or high blood pressure is a condition in which the blood vessels have persistently raised pressure. Blood pressure is considered to be raised or high, when the systolic blood pressure is equal to or above 140 mm Hg and/or the diastolic blood pressure is equal to or above 90 mm Hg (WHO, 2013). It is considered the most significant modifiable risk factor for cardiovascular disease and is identified as the primary risk factor for mortality around the world (WHO, 2013). Nevertheless, it is not always taken seriously and often poorly controlled (Petrella and Campbell, 2005; Joffres et al., 1997).

Hypertension is commonly diagnosed in older males and females. In Canada, approximately 53.2% of older adults aged 60 to 79 years have been diagnosed with high blood pressure (Wilkins et al., 2010). Management of hypertension in older adults is crucial, since age is one of the leading risk factors for hypertension and older people are more susceptible to suffer from the complications of hypertension. Although non-pharmacological management of hypertension can treat milder forms of hypertension, these strategies are often overlooked in the elderly population (Lionakise et al, 2012). In management of hypertension dietary sodium is a key dietary element to control. Therefore, the current study intended to address the food purchasing and consumption behaviour of community dwelling older adults living in London, Ontario in the context of sodium and hypertension status.

Sodium is an essential nutrient needed to regulate blood volume and proper cell function (National Institute of Health (NIH), 2013). However, most Canadians consume far more than the amount needed for good health as well as the recommended intake levels (Tanase et al., 2011). Epidemiological, experimental and review studies have repeatedly established a causal relationship between excess sodium intake, elevated blood pressure, and subsequent cardiovascular disease (Cook et al., 2007; Elliott et al., 1996; Geleijnse et al., 2003; He and MacGregor, 2002; Kesteloot and Joossens, 1988; Sacks et al., 2001). It is evident from several randomized controlled trials that a reduction of dietary sodium can lower arterial blood pressure (Sacks et al., 2001; He and MacGregor, 2002; Whelton et al., 1998). Thus, scientific findings and clinical guidelines recommend dietary sodium reduction among people with and without hypertension in order to treat hypertension prior to any pharmaceutical interventions (Hackam et al., 2013). However, maintaining a sodium restricted diet is neither simple to achieve nor easy to maintain for hypertensive individuals (Luft et al., 1997).

It has been estimated that the prevalence of hypertension would lower by 30% if the sodium intake of Canadians could be brought down to 1840 mg/day from the current average intake of 3400 mg/d (Joffres et al., 2007; Penz et al., 2008). To achieve a population-level sodium reduction in Canada, Health Canada's Working Group on Dietary Sodium Reduction has suggested a voluntary sodium reduction approach along with other strategies (Sodium Working Group (SWG), 2010). Since the approach is voluntary, it is possible that only a few food manufacturers and food service outlets would agree to lower sodium in their products (Barr, 2010). As a result, individuals with

hypertension need to make lower sodium choices while purchasing foods at the grocery or other food stores.

Convenience has become one of the biggest factors that drives Canadian consumers' food choices (Agriculture and Agri-Food Canada, 2010). The aging population of Canada is embracing convenience options to reduce the effort involved in cooking and maximize their free time (Agriculture and Agri-Food Canada, 2010). In order to meet the present consumer demands, convenience foods are often available in the market. These foods are usually higher in sodium, sugar, and fats with little nutritional value (Fischer et al., 2009). In fact, 77% of sodium in the Canadian diet comes from processed foods (Garriguet, 2007) . Hence, food choice, which is usually a part of food purchasing behaviour, plays a vital role in the process of achieving and maintaining a low sodium diet.

In addition to lowering dietary sodium intake, the Canadian Hypertension and Education Program (CHEP) recommends the DASH (Dietary Approaches to Stop Hypertension) diet plan for both hypertensive patients and normotensive individuals at increased risk of developing hypertension (Dasgupta et al., 2014). The DASH diet emphasizes fruits, vegetables, low-fat dairy products, dietary and soluble fibre, whole grains and protein from plant sources, and foods that are reduced in saturated fat and cholesterol. Previous research showed that the combination of the DASH diet and reduced sodium intake have the greatest effect on blood pressure (Sacks et al., 2001). Although a growing body of evidence has established the role of a DASH diet in lowering blood pressure; to our knowledge, no study was conducted in Canada to examine the adherence to this diet among hypertensive older adults.

In this regard, the current study investigated the association between hypertension status and the amount of sodium purchased and consumed by the older adults with and without hypertension. To better understand their consumption behaviour, the study also evaluated the older adults' adherence with the DASH diet (i.e. their intake of nine different nutrients that are important for hypertension management). The study also explored the older adults' knowledge, concern and behaviour regarding dietary sodium to find possible relationships among these parameters and the sodium content of food products they bought and consumed.

CHAPTER 2

LITERATURE REVIEW

2.1 **Hypertension**

As defined by WHO, hypertension or high blood pressure is a condition in which the blood vessels have persistently raised pressure. The force of blood pushing against the walls of the blood vessels (arteries) as it is pumped by the heart creates blood pressure. The higher the pressure the harder the heart has to pump. A blood pressure of 120 mm Hg when the heart beats (systolic) and a blood pressure of 80 mm Hg when the heart relaxes (diastolic) are considered as normal adult blood pressure (WHO, 2013). Blood pressure is considered to be raised or high, when the systolic blood pressure is equal to or above 140 mm Hg and/or the diastolic blood pressure is equal to or above 90 mm Hg (WHO, 2013). It is the most significant modifiable risk factor for cardiovascular disease and is identified as the primary risk factor for mortality around the world (WHO, 2009). It is estimated that 7.5 million deaths per year (13% of all deaths) around the world is caused by hypertension (WHO, 2009). Nevertheless, it is not always taken seriously and often poorly controlled (Joffres et al., 1997; Petrella & Campbell, 2005).

2.2 **Aging and Increased Risk of Hypertension**

The prevalence of hypertension has been found to be higher in older Canadians (over 65 years old) (Figure 2.1) (Statistics Canada, 2012). In Canada, approximately 53.2% of

older adults aged 60 to 79 years have been diagnosed with high blood pressure (Wilkins et al., 2010). A retrospective population based study involving Canadian adults aged 20 years and older from 1998/99 to 2007/08 found that older women (over 60 years old) have a higher prevalence than older men (Robitaille et al., 2012). According to a community-based prospective cohort study among US adults aged 55 to 65 years who were free of hypertension at baseline, approximately 60% of the population developed hypertension by age 60, and about 65% of men and about 75% of women had the disease by age 70 (Vasan et al., 2002). In the same study, it was projected that more than 90% of normotensive individuals aged 55 to 60 years would develop hypertension over their lifetime (Vasan et al., 2002).

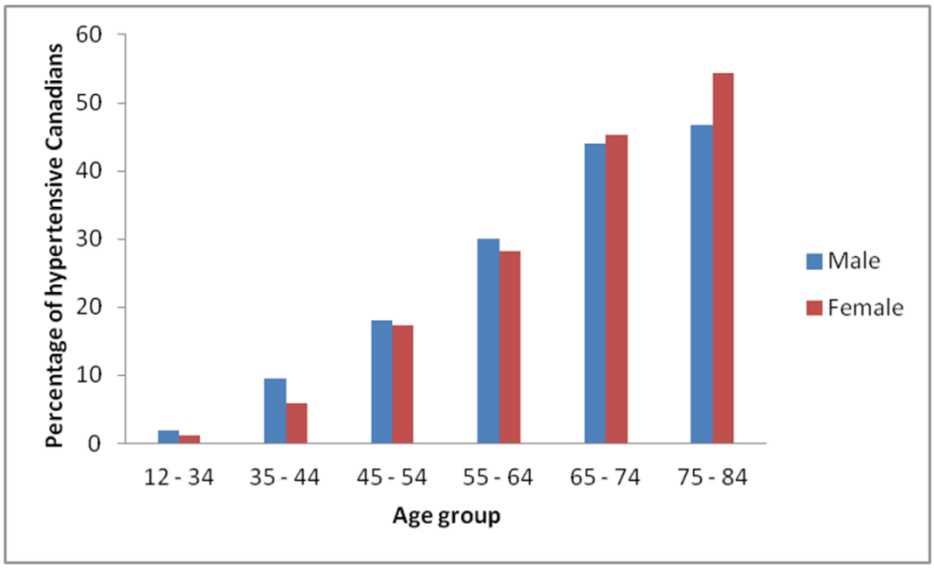

Figure 2.1: Percentage of Canadians self-reporting that they have high blood pressure, by age group and sex, household population aged 12 or older (Statistics Canada, 2012)

Management of hypertension in older adults is essential because of its higher prevalence in this demographic group. Moreover, older adults are more susceptible to suffer from the complications of hypertension compared to younger adults (Messerli et al., 1983). These

complications include lower cardiac output, higher peripheral resistance, lower intravascular volume, and lower renal blood flow (Messerli et al., 1983). Control of high blood pressure would reduce the risk of several associated diseases including stroke, coronary heart disease, and cognitive decline in older adults. Although non-pharmacological management (i.e. weight loss, physical activity, DASH diet plan etc.) of hypertension can treat milder forms of hypertension, it is often overlooked in the elderly population (Lionakise et al, 2012). For example, dietary sodium is a key dietary element to control.

2.3 **Dietary Sodium and Hypertension**

Epidemiological, experimental and review studies have repeatedly established a causal relationship between excess sodium intake, elevated blood pressure, and subsequent cardiovascular disease (Cook et al., 2007; Elliott et al., 1996; Sacks et al., 2001; Sacks & Compos, 2010; Strazzullo et al., 2009). The causal relationship between sodium intake and blood pressure across many populations has been established in the multinational INTERSALT studies (Elliott et al., 1996; Stamler, 1997). The INTERSALT Study was a standardized, epidemiologic study of a large sample size aged 20 to 59 years from 32 countries around the world. The study showed a significant, positive, independent linear association between dietary sodium, measured by 24-hour urinary sodium excretion, and systolic blood pressure (Stamler, 1997). It is evident from several randomized controlled trials that a reduction of dietary sodium can lower arterial blood pressure (He and MacGregor, 2002; Sacks et al., 2001; Whelton et al., 1998). A randomized controlled study comparing the effect of three levels (high, intermediate and low) of sodium intake

during a control diet (typical American diet) on blood pressure found that sodium reduction from high (150 mmol/day) to intermediate level (100 mmol/d) reduced the systolic blood pressure by 2.1 mm Hg (Sacks et al., 2001). Moreover, dietary sodium reduction from intermediate (100 mmol/d) to low level (50 mmol/d) caused additional reduction of systolic blood pressure by 4.6 mm Hg (Sacks et al., 2001).

The Canadian Community Health Survey (CCHS) provided information on current sodium intake of Canadians (Garriguet, 2007). Although some sodium is needed to regulate blood volume and proper cell function, Canadians of all ages consume more than twice the recommended Adequate Intake (AI) level of 1500 mg/day (Fischer et al., 2009; Garriguet, 2007; Tanase et al., 2011). The results from the survey indicated that over 85% of men and 60% of women aged 19 to 70 years had sodium intakes in excess of the recommended Tolerable Upper Intake Level (UL = 2300 mg/d) beyond which health risks increase (Garriguet, 2007). The average intake of sodium among Canadian adults is reported to be 3400 mg/day which far exceeds the UL (Health Canada, 2012). Higher health risks are associated with a sodium intake above the UL. The need for effective control of sodium intake is evident.

In Canada, it has been suggested that almost 30% of hypertension cases occur because of excess dietary sodium (Joffres et al., 2007). It is estimated that if the prevalence of hypertension is reduced by 30%, annually 23,500 cardiovascular events would be prevented (Joffres et al., 2007; Penz et al., 2008). Consequently, if hypertension could be controlled Canada would reduce a huge amount of its annual health care costs (Joffres et al., 2007).

2.4 **Sources of Sodium in the Canadian Diet**

Both Canadian children and the adult population consume unhealthy levels of sodium due to the types of food they eat at home and in restaurants (Tanase et al., 2011). Salt is the primary source of sodium in our diet with other sources being food additives like monosodium glutamate, sodium bicarbonate (baking soda) etc. The major proportion of sodium in the Canadian diet is added to food during processing (Garriguet, 2007). Processed foods, including restaurant and fast foods, are a major source of sodium in our diet. It has been estimated that approximately 77% of sodium in our diet comes from processed foods, 12% occurs naturally in foods, 6% is added at the table, and 5% is added during cooking (Brown et al., 2009; Garriguet, 2007; Mattes and Donnelly, 1991)

The Canadian Community Health Survey (CCHS), Cycle 2.2, Nutrition (2004) identified the major food groups that contribute to dietary sodium in Canadian diets. Processed meats, breads, some canned foods, cheeses, breads, cereals, sauces, pickled foods, commercial rice or pasta mixes and condiments are reported to be the common sources of sodium in our diet (Health Canada, 2007; Fischer et al., 2009).

To achieve a population-level sodium reduction in Canada, Health Canada's Working Group on Dietary Sodium Reduction has suggested a voluntary sodium reduction approach, an education and awareness strategy, and research and surveillance (Sodium Working Group, 2010). A voluntary approach would be successful if all the food manufacturers and food service outlets agreed to lower sodium in their food so that consumers do not need to choose between low and high sodium foods (Barr, 2010). However, since it is voluntary, there is no guarantee this happens. Hence, consumers

need to make informed choices according to their health conditions when purchasing and consuming food products.

2.5 **Canadian Guidelines for Hypertension Management**

The Canadian Hypertension Education Program (CHEP) provides evidence-based recommendations for prevention, diagnosis and treatment of hypertension. For prevention and treatment, guidelines for health behaviour management including physical exercise, weight management, dietary recommendations, alcohol consumption, sodium intake and stress management are documented (Dasgupta et al., 2014). To reduce blood pressure, CHEP recommends to reduce dietary sodium intake toward 2000 mg (5 g of salt or 87 mmol of sodium) per day (Dasgupta et al., 2014).

According to CHEP, the DASH diet is recommended for both hypertensive patients and normotensive individuals at increased risk of developing hypertension (Hackam et al., 2013; Dasgupta et al., 2014). The DASH diet emphasizes fruits, vegetables, low-fat dairy products, dietary and soluble fibre, whole grains, and protein from plant sources (National Institute of Health (NIH), 2006). Overall, the DASH diet emphasizes the foods rich in nutrients (i.e. potassium, magnesium, calcium) that help lower blood pressure levels (Houston and Harper, 2008). This dietary pattern is similar to the Eating Well with Canada's Food Guide (Health Canada, 2011; NIH, 2006).

Randomized controlled trials have established that the DASH diet can significantly lower systolic blood pressure in hypertensive patients (Moore et al., 2001; Sacks et al., 2001; Svetkey et al., 1999). Besides, previous research showed that the combination of the

DASH diet and reduced sodium intake have the greatest effect on blood pressure (Sacks et al., 2001). For instance, a randomized controlled trial examined the effects of three level of sodium (150 mmol/d, 100 mmol/d, and 50 mmol/d) and two dietary patterns (control diet and DASH diet) on blood pressure among 412 participnats. The study found that reducing sodium intake from 150 mmol/d to100 mmol/d while consuming the DASH diet reduced systolic blood pressure by 1.3 mm Hg. Moreover, reducing sodium intake to 50 mmol/d caused an additional reduction of 1.7 mm Hg blood pressure while on the DASH diet (Sacks et al., 2001). Other randomized controlled trials investigating the effects of the DASH diet on blood pressure in subgroups found that the DASH diet caused greatest reductions in blood pressure among African-Americans, hypertensive and older individuals (Svetkey, 1999; Vollmer et al., 2001). Although a growing body of evidence has established the role of a DASH diet in lowering blood pressure, to our knowledge, no research was conducted to investigate the adherence to this diet among Canadian hypertensive older adults.

The DASH diet is routinely recommended by the Canadian Health Education Program and the American Heart Association (AHA) to help control blood pressure of normotensive and hypertensive individuals (American Heart Association (AHA), 2012; Hackam et al., 2013). Overall, the DASH diet recommends to choose products which are either labeled as “low in fat” or “fat-free”, and those stating “reduced sodium”, “low-sodium”, “unsalted”, or “salt-free” (NIH, 2006). Hence, food choice, which is usually a part of food purchasing behaviour, plays a vital role in the process of achieving and maintaining a low sodium diet.

2.6 **Research Investigating Knowledge, Concern and Behaviours Related to Sodium**

The above discussion suggests that dietary sodium reduction is an important measure for hypertension management and that food selection is a vital part when it comes to lowering sodium intake. In order to make the lower sodium food choices, it is important that consumers have the knowledge related to sodium, its sources, recommended levels of daily intake and food label comprehension. A random-digit-dial telephone survey study was conducted to explore Ontario residents' knowledge related to dietary sodium. The study revealed that the majority of the participants were aware of the health issues related to excessive sodium intake (Papadakis et al., 2010). However, a large proportion of them were not able to identify many of the popular foods in the mainstream Canadian diet that are high in sodium (Papadakis et al., 2010). Moreover, these food products were reported to be consumed very frequently by the consumers. Thus, this gap in knowledge suggests that it could be possible that consumers are making higher sodium food choices without knowing.

A recent national survey conducted in Canada found that 67.0% of respondents were concerned about dietary sodium and 59.3% were taking action to reduce sodium intake (Arcand et al., 2013). However, the above studies did not verify their findings with actual sodium consumption and adherence with sodium recommendations through dietary intake or sodium excretion data. Moreover, the studies were based on self-reported data. Previous literature on dietary behaviours suggest that respondents could be susceptible to social approval bias, which may drive self-report data toward more socially desirable

responses (Hebert et al., 1995; Miller et al., 2008). Therefore, the current study sought to investigate older adults' food selections related to sodium by using food purchasing receipts data and dietary intake besides assessing their knowledge, concern and behaviour.

2.7 **Food Label Use by Canadians**

In Canada, consumers can obtain nutrition information from the mandatory Nutrition Facts Table (NFT) which can be found in almost all the pre-packaged foods. The NFT identifies the amount of 13 core nutrients including sodium in each food product (Health Canada, 2008a). The NFT provides the amount of nutrients in both grams/milligrams and % DV (Daily Value). The % DV provides a quick overview of the nutrient profile of a food item and is helpful for making informed food choices and comparing between brands (Health Canada, 2008b).

About 60% of Canadian consumers reported "always" or "usually" reading the nutrition labels on food packages in a survey conducted in 2008 (Health Canada, 2008a). The NFT and ingredient list were found as the main sources of information to help determine the nutrient content of a food (Health Canada, 2008a). Although many Canadian consumers compared nutrition information on food products, only about 20% of them sought nutrition information when eating out (Health Canada, 2013).

Canadian food products can also provide two types of nutrition claims (i.e. nutrient content claims and health claims) (Health Canada, 2010). A nutrient content claim specifies the amount of a specific nutrient in a food (e.g., "source of calcium", "reduced

in sodium"). Health claims are defined as "any statement or representation that states, suggests or implies that a relation exists between a food or component of that food and health" (Health Canada, 2010). Health claims are used to communicate the health benefits of specific nutrients. An example of a health claim is "A healthy diet low in sodium may reduce the risk of hypertension". However, health claims are not mandatory in Canada, so not all brands will include one. Previous consumer research reported that nutrient content and health claims are the least favourite form of information on food labels. Only 21% and 18% of Canadian consumers, respectively, look for nutrient content claims and health claims on food labels (Canadian Council of Food and Nutrition, 2008).

However, a recent online survey revealed that Canadian consumers with hypertension are more willing to purchase a food product with any sodium claim (Wong et al., 2013). However, only ~ 5-7% of North American products contain a claim that talks about sodium (Legault et al., 2004; Schermel et al., 2013). Hence, NFT remains as the main source of information when it comes to choosing a lower sodium product.

In order to make informed food choices, it is important that consumers have the knowledge related to food label comprehension. However, studies demonstrate that, despite educational efforts by Health Canada and others, the understanding of nutrition labelling is not reaching its full potential to assist Canadians in making informed food choices (Health Canada, 2013).

2.8 **Food Purchasing and Consumption Behaviour of Older Adults**

Consumption behaviour involves the food choices made by the individual at the supermarket (Martin et al., 2006). Household food purchasing behaviour is an important measure of an individual's food choices. Food choices can occur in grocery stores, supermarkets, fast-food places, restaurants, vending machines, and convenience stores. The term "household food purchasing behaviour" pertains to all the foods and beverages bought by a household from all types of food stores (French et al., 2008).

To date, three types of measures for food purchasing behaviour have been used most often in research studies: home food inventories, food and beverage purchase records and receipts, and Universal Product Code bar code scanning (French et al., 2008). A review paper comparing three different measures of household food purchasing behaviour concluded that annotated food purchase receipts over a 2 to 4 week time period is best for describing household food purchasing behaviour and for tracking changes in food purchasing patterns over time (French et al., 2008).

Household food purchasing behaviour can be influenced by various factors including age. Previous studies have investigated food purchasing and consumption behaviour of older adults in relation to socio-demographic status, food safety and health aspects. Households with older adults, higher income and higher educated members were found to spend a bigger proportion of income on fruits and vegetables (Pérez, 2002; Ricciuto et al., 2006). Studies investigating consumption behaviour of Canadians found similar findings (Garriguet, 2004; Nesbitt et al., 2008). These studies also found that older adults are less interested in convenience foods and foods prepared outside of the home (Garriguet, 2004;

Nesbitt et al., 2008). On the other hand, other studies found that older adults use different strategies and approaches while acquiring and preparing food than the younger population. For instance, sometimes they choose prepared or ready-to-eat meals in order to ease their food preparation time as well as to prevent dependency regarding meal preparation (Sidenvall et al., 2001).

In the last decade, the convenience food market has substantially grown in Canada. An important factor in this growth is the change in Canada's consumer demographics (Agriculture and Agri-Food Canada, 2010). For instance, the population of Canada is aging. The percentage of Canadians aged 65 and older has increased from 8% in 1971 to 14.4% in 2011(Employment and Social Development Canada, 2012). In addition, Canada's largest birth cohort, the baby boom generation, began turning 65 in 2011. This aging population is embracing convenience options to reduce the effort involved in cooking and maximize their free time (Agriculture and Agri-Food Canada, 2010). In order to meet the present consumer demands, convenience foods i.e. frozen dinners, ready-to-eat foods, canned products etc. are often available in the market presently. However, these prepared or ready-to-eat meals are usually higher in sodium, sugar, and fats with little nutritional value (Fischer et al., 2009).

Besides nutrition and health consideration, there are several factors (i.e. price/cost, taste/flavour, freshness, familiarity with the food products, personal preference etc.) that impact an individual's food purchasing behaviour (Rolfes et al., 2006; French, 2003; Piché and Garcia, 2001). Some of these factors may influence an individuals' food choice towards low-sodium foods.

A qualitative descriptive study of 20 heart patients identified lack of knowledge, interference with socialization and lack of food selection as factors related to nonadherence to low sodium diet (Bentley et al., 2005).The Indiana University demonstration project showed that adhering to a sodium-restricted diet was feasible in 50% of hypertensive individuals; nevertheless, it was challenging for those individuals and required comprehensive steps (Luft et al., 1997). These comprehensive steps for achieving a long lasting dietary change included knowledge and motivation towards the changes, regular educational counseling, goal setting, self-monitoring, etc. (Dawyer, 1991; Luft et al., 1997). A recent multicentre observational study investigating adherence to a low-sodium diet in patients with heart failure found that participants are more likely to follow a low-sodium diet when their family members also follow the diet (Chung et al., 2013).

In summary, the Canadian food market offers a variety of prepackaged, canned and processed foods more often than before which are usually higher in sodium, fat and sugar, and lower in other nutritional values. Older adults are more likely to buy these food products to make their food preparation easy and to prevent dependency regarding meal preparation (Sidenvall et al., 2001). Hence, food choice, which is usually a part of food purchasing behaviour, plays a vital role in the process of achieving and maintaining low sodium diet. Although previous studies focused on the knowledge and concern of Canadian adults regarding dietary sodium reduction and hypertension status, they did not observe their actual food choice or consumption in relation to sodium. Therefore, the purpose of the current study was to investigate older adults' food purchasing and

consumption behaviour in the context of sodium and hypertension status. The secondary objective of this study was to evaluate older adults' adherence with the DASH diet.

CHAPTER 3

SCOPE OF RESEARCH

Scientific findings and public health organizations recommend dietary sodium reduction among people with and without hypertension in order to prevent and treat hypertension prior to any pharmaceutical interventions (Hackam et al., 2013). Although non-pharmacological management (i.e. weight loss, physical activity, DASH diet plan, etc.) of hypertension can treat milder forms of hypertension, it is often overlooked in the elderly population (Lionakise et al, 2012). The Canadian food supply offers a variety of prepackaged, canned and processed foods more often than before which are usually higher in sodium, fat and sugar, and lower in other nutritional values (Fischer et al., 2009). However, the aging population of Canada is embracing these convenience options to reduce the effort involved in cooking and maximize their free time (Agriculture and Agri-Food Canada, 2010). Hence, food choice at the grocery store plays a vital role in the process of achieving and maintaining a low sodium diet. Since both food purchasing and consumption behaviour reflect an individual's food choices, the current study investigated whether having hypertension had an influence on older adults' food choices in relation to sodium when purchasing and consuming food. The secondary objective of this study was to evaluate older adults' adherence with the DASH diet.

The findings from this comprehensive research will provide valuable insight on older adults' knowledge, concern, behaviour in addition to actual purchase and consumption patterns with respect to their hypertension status. The results from the study will help

health educators to design health promotion programs that could be aimed towards low-sodium food purchasing practices specifically for this demographic segment.

3.1 **Research Questions and Objectives**

The overall purpose of the current study was to investigate the food purchasing and consumption behaviour of community dwelling older adults in the context of sodium and hypertension. The following research questions were addressed:

1. Is there any difference in the amount of daily sodium purchased between hypertensive and normotensive older adults?
2. Is there any difference in the amount of daily sodium consumed between hypertensive and normotensive older adults?
3. Is there any difference in the DASH score by hypertension status of older adults?

The research study also examined the following to better understand purchasing and consumption behaviour:

- Knowledge and concern regarding dietary sodium and hypertension,
- Sodium reducing behaviour (e.g., regular actions taken by the participants),
- Use of NFT for sodium.

CHAPTER 4

FOOD PURCHASING AND CONSUMPTION BEHAVIOUR OF OLDER ADULTS

4.1 **Introduction**

Dietary sodium reduction is an important part of dietary self-management of hypertension. In Canada, almost 30% of the hypertension occurs because of excess dietary sodium (Joffres et al., 2007). It is estimated that if the prevalence of hypertension is reduced by 30%, annually 23,500 cardiovascular events would be prevented (Joffres et al., 2007; Penz et al., 2008). Consequently, Canada would be able to reduce a huge amount of annual health care costs (Joffres et al., 2007). Although population-wide dietary sodium reduction would be an effective way to lower the prevalence of hypertension as well as reduce the annual cost of health care, it is not always taken seriously and often poorly controlled (Joffres et al., 1997; Petrella & Campbell, 2005).

To achieve a population-level sodium reduction in Canada, Health Canada's Working Group on Dietary Sodium Reduction has suggested a voluntary sodium reduction approach along with other strategies like education and awareness, research and surveillance (Sodium Working Group (SWG), 2010). If the sodium reduction approach was mandatory, individuals would not have to compare between brands for a lower sodium option. However, since the approach is voluntary, it is possible that only a few food manufacturers and food service outlets would agree to lower sodium in their

products (Barr, 2010). Therefore individuals with hypertension need to make informed choices when purchasing foods at the grocery or other food stores.

In addition convenience has become one of the biggest factors that drives Canadian consumers' food choices (Agriculture and Agri-Food Canada, 2010). Specifically, the aging population of Canada is embracing convenience options in order to maximize their leisure time inspite of having cooking skills (Agriculture and Agri-Food Canada, 2010). In order to meet the present consumer demands, convenience foods (i.e. frozen dinners, ready-to-eat foods, canned products etc.) are often available in the market. These foods are usually higher in sodium, sugar, and fats with little nutritional value (Fischer et al., 2009). In fact, 77% of sodium in the Canadian diet comes from processed foods (Garriguet, 2007; Mattes and Donnelly, 1991).

As a result, food selection has become an important consideration when it comes to sodium reduction for hypertensive individuals. However, upon examining the literature, there was no study investigating the influence of hypertension status on the food choices of Canadian older adults. Therefore, the purpose of the current study was to investigate the association between hypertension status and the amount of sodium purchased and consumed.

Food purchasing behaviour is an important measure of an individual's daily food choice and often reflects consumption. Individual's food choices can occur in grocery stores, supermarkets, fast-food places, restaurants, vending machines, and convenience stores. In order to get a bigger picture of an individual's food choice and dietary quality, it is important to measure household food purchasing behaviour. The term "household food

purchasing behaviour" pertains to all the foods and beverages bought by a household from all types of food stores. Household food purchasing behaviour can be measured by using home food inventories, food and beverage purchase records and receipts, and Universal Product Code bar code scanning (French et al., 2008). However, a review study comparing these measures concluded that food purchase receipts with annotation over a 2 to 4 week time period is best for describing household food purchasing behaviour and for tracking changes in food purchasing patterns over time (French et al., 2008).

In addition to reduction in dietary sodium, the Canadian Hypertension Education Program (CHEP) recommends a dietary pattern known as Dietary Approach to Stop Hypertension or DASH diet. This dietary pattern emphasizes fruits, vegetables, low-fat dairy products, dietary and soluble fibre, whole grains, and protein from plant sources, and foods that are reduced in saturated fat and cholesterol. The DASH diet is recommended for both hypertensive patients and normotensive individuals at increased risk of developing hypertension (Hackam et al., 2013). Randomized controlled trials have established that the DASH diet can significantly lower systolic blood pressure in hypertensive patients (Moore et al., 2001; Sacks et al., 2001; Svetkey et al., 1999).

Although a growing body of evidence has established the role of a DASH diet in lowering blood pressure, in Canada, no study investigated the adherence of this diet among hypertensive individuals. Therefore, as a secondary objective of the present study, adherence with DASH nutrient intake was evaluated to better understand older adults' consumption behaviour in relation to their hypertension status.

Therefore, the research study used a convenience sample of community dwelling older adults to investigate the following research questions:

1. Is there any difference in the amount of daily sodium purchased between hypertensive and normotensive older adults?

2. Is there any difference in the amount of daily sodium consumed between hypertensive and normotensive older adults?

3. Is there any difference in the DASH score by hypertension status of older adults?

In addition, the study explored their knowledge, concern, and behaviour regarding dietary sodium to better understand the influence of these parameters on the primary findings of the study. The findings from the study will identify where sodium reduction strategies should be focussed.

4.2 **Methods**

4.2.1 Participants

A convenience sample of 30 older adults was recruited from several organizations **(Appendix A)** including senior centres, malls and public libraries in London, ON to participate in the research study. A participant recruitment flyer **(Appendix B)** was also distributed at the possible locations where older adults usually gather. However, participation yield was lower with this method. The study was publicized as a general

food survey in order to minimize bias in participant recruitment regarding sodium purchases and consumption.

Individuals were included in the study if they were over 65 years old, living independently within the community, responsible for grocery shopping in their household, shopping at a grocery store at least once a week and eating at least two main meals per day at home. The inclusion criteria were created to ensure that the grocery receipts were representative of what people ate. Individuals who were receiving any meal-assisted service (e.g., meals on wheels) or showed any indication of cognitive dysfunction were not eligible to participate in the study.

Participant's eligibility was determined at the beginning of the recruitment process by using a set of questions regarding the eligibility criteria **(Appendix C).** An individuals' decision to participate in the study was entirely voluntary. All participants signed informed consent form **(Appendix D)** before participating. The research protocol was approved by the University of Western Ontario Research Ethics Board (REB#104368) **(Appendix E)**.

4.2.2 Instruments and Procedure

Three types of instruments (food receipts, 24-hour recall and an interview) were used to collect the data from November 2013 to May 2014. However, no data were collected from Dec 13th to 31st, 2013 to avoid any special-occasion influence on their purchasing and consumption.

4.2.2.1 Grocery/restaurant receipts

Participants provided all their receipts for food and beverage purchases over a continuous two week period along with a food item explanation form. The explanation form **(Appendix F)** was given to them at the time of recruitment to write down specifications of the food items if not clear from the receipts. Participants were also asked to write down any food purchases for which there was no receipt available (i.e. in case of farmers market or church bazaar) and to report to the researcher in the case of missing receipts from any stores. In order to reduce the chance of under-reporting, participants were encouraged to keep a zip lock bag with a reminder notification for saving the grocery receipts for the study.

For all the food purchases reflected on the food receipts, information on the food item, serving size, the amount of sodium (mg) and calories (kcal) per serving size were entered in Microsoft Excel spreadsheet. This information was collected from the nutrient facts table of the food items or the fast food/restaurant website (if they had one). After entering the data, the amount of sodium (mg) per 1000 kcal for each purchase was calculated (Rankin et al., 1998) in order to make a common unit more representative of daily consumption. The daily amount of sodium is calculated from the two weeks purchase data by dividing it by 14.

The food items from the receipts were divided into 11 major food groups: fruits and vegetables (f&v), breads and breakfast cereals, meat and alternatives, processed meats, milk and alternatives, cheese, salty snacks (i.e. potato chips), soups (canned), condiments (i.e. sauces, gravies, pickles etc.), prepackaged meals (i.e. frozen dinner, ready-made

meals, microwave meals etc.), and fast foods/restaurant foods. The percentage of sodium contributing to each food group was calculated and the top contributors for both groups were identified.

4.2.2.2 Multiple 24-hr recalls

Diet history was collected using multiple 24-hr recalls (**Appendix G**) administered by the researcher. In order to optimize recall, the five steps of the Automated Multiple-Pass Method (AMPM) were followed (Health Canada, 2007). The AMPM is an automated questionnaire designed to optimize a participant's remembrance of foods eaten in the preceding 24 hours (Health Canada, 2007). The 24-hour recalls were collected at the beginning of the 1st week, and the end of the 1st and 2nd week of the data collection period. This was done to ensure that the food purchases reflected their food consumption.

To assess adherence with the DASH diet plan, a DASH-score as suggested by Mellen et al. (2008) was used. DASH targets for a total of nine nutrients (total fat, saturated fat, protein, fibre, cholesterol, calcium, magnesium, potassium, and sodium) were identified for the DASH score. The 24-hr dietary recalls were entered into the ESHA Food Processor SQL (version 10.11.0.0) to identify the amounts of target nutrients. Then the percentage contribution of these nutrients to the total energy was calculated. The maximum DASH score is 9, calculated by summing all the nutrient targets met. Individuals achieved a score of 1 if they met a DASH nutrient target and a score of 0.5 if they met a goal intermediate between the DASH goal and the nutrient content of the DASH control diet for that nutrient (

Table 4.1). For example, participants scored 1 if they consumed less than 1143 mg/1000 kcal/d of sodium (DASH target for sodium), 0.5 if they consumed more than 1143 mg/1000 kcal/d but less than 1286 mg/1000 kcal/d (intermediate target for sodium) of sodium and 0 if they consumed more than 1286 mg/1000 kcal/d of sodium. Individuals scoring a DASH score half of the DASH target (i.e., a DASH score $\geq$ 4.5) were considered adherent to the DASH diet (Mellen et al., 2008).

Table 4.1: Nutrient Targets for DASH Score

Nutrient	DASH Diet Nutrient Composition[a]	DASH Score Target	Intermediate Target
Total Fat	27% of energy	27% of energy	32% of energy
Saturated Fat	6% of energy	6% of energy	11% of energy
Protein	18% of energy	18% of energy	16.5% of energy
Cholesterol	150 mg	71.4 mg/1000 kcal	107.1 mg/1000 kcal
Fibre	31 g	14.8 g/1000 kcal	9.5 g/1000 kcal
Magnesium	500 mg	238 mg/1000 kcal	158 mg/1000 kcal
Calcium	1240 mg	590 mg/1000 kcal	402 mg/1000 kcal
Potassium	4700 mg	2238 mg/1000 kcal	1534 mg/1000 kcal
Sodium[b]	2400 mg	1143 mg/1000 kcal	1286 mg/1000 kcal

[a] Based on a 2100-kcal diet.
[b] Sodium Target Based on the Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure recommendations (Mellen et al., 2008).

4.2.2.3 Interview Questionnaire

At the end of the second week, a short interview was conducted by the researcher. The study questionnaire **(Appendix H)** addressed knowledge, concern and behaviour pertaining to acquisition and consumption of sodium, actions taken to reduce dietary sodium on a regular basis, the presence of hypertension and other chronic diseases and the participant's demographics. Similar to Shi et al. (2011), hypertension status was determined by asking participants if they were diagnosed with hypertension by a health

care professional. Those with a response “yes” were considered hypertensive and “no” were considered normotensive. The questionnaire used was taken from a similar survey prepared for the Public Health Agency of Canada by Decima Research (Decima Research, 2009). However, a few questions were removed since they did not serve the purpose of the present research study.

To assess the participants’ knowledge, they were asked about the recommended daily intake of sodium, sources of sodium in the Canadian diet and the medical conditions associated with higher sodium intake. They were also asked to categorize a list of popular foods as being low, moderate or high in sodium. For each correct response for knowledge questions, participants were given a score of 1 and the maximum score was 18. Participants who scored higher than 9 were considered knowledgeable.

Participants’ concern was assessed using a single question: “How concerned are you about the amount of sodium in your diet?” Their responses were ranked using a 0 to 4 point scale, where 0 = not at all concerned and 4 = extremely concerned. Responses of concern about sodium were dichotomized based on responses: “3 or 4” = “concern” and “0, 1 or 2” = “no concern”. Behaviour questions included the frequency of reading NFT while purchasing food items and comparing sodium content among different brands. Participants were also asked about the actions they took on a regular basis and specifically over the past month to control or reduce the amount of sodium in their diets.

4.2.3 Statistical analyses

All data from the questionnaire were entered in a Microsoft Excel spreadsheet. Quantitative data were analyzed through the calculation of summary statistics including

frequencies and percentages. For all the research questions, data were analyzed using independent t-tests in order to determine the statistically significant difference between the groups. All statistical analyses were performed using the Minitab15 data analysis software with $p<0.05$ considered statistically significant.

4.3 **Results**

4.3.1 Participant characteristics

A total of 42 older adults from nine 9 different organizations were approached to participate in the study. Among them 12 older adults did not meet the inclusion criteria. The remaining 30 older adults contributing data to the study were exclusively female (100%) with a mean age of 75.6 ± 7.5 years and mean BMI of 25.8 ± 6.4 kg/m^2. Demographic and lifestyle characteristics are summarized in Table 4.2.

Table 4.2: Descriptive characteristics of participants (n=30)[1,2]

	Hypertensive (n=16)	Normotensive (n=14)	All (n=30)
Variables	n (%)	n (%)	n (%)
Age (years)			
65 – 69	4 (25.0)	4 (28.6)	8 (26.7)
70 – 74	3 (18.8)	4 (28.6)	7 (23.3)
75 – 79	3 (18.8)	2 (14.3)	5 (16.7)
80 – 85	4 (25.0)	2 (14.3)	6 (20.0)
85+	2 (12.5)	2 (14.3)	4 (13.3)
Annual Household Income (Canadian $)			
< $40,000	7 (58.3)	8 (61.5)	15 (60.0)
$40,000 - $75,000	5 (41.7)	2 (15.4)	7 (28.0)
$75,000 - $100,000	0 (0.0)	2 (15.4)	2 (8.0)
>$100,000	0 (0.0)	1 (7.7)	1 (4.0)
Education			
Elementary school	2 (12.5)	0 (0.0)	2 (6.7)
High school	4 (25.0)	6 (42.9)	10 (33.3)
Community college	6 (37.5)	3 (21.4)	9 (30.0)

Completed university	4 (25.0)	5 (35.7)	9 (30.0)
BMI (kg/m^2)			
< 18.5	1 (6.3)	1 (7.1)	2 (6.7)
18.5-24.9	5 (31.3)	9 (64.3)	14 (46.7)
25-29.9	5 (31.3)	3 (21.4)	8 (26.7)
>30	5 (31.3)	1 (7.1)	6 (20.0)
Number of People in household			
1 (i.e. live alone)	12 (75.0)	11 (78.6)	23 (76.7)
2	4 (25.0)	3 (21.4)	7 (23.3)
Frequency of Grocery Shopping			
1 per week	12 (75.0)	5 (35.7)	17 (56.7)
2 per week	2 (12.5)	0 (0.0)	2 (6.7)
3 or more per week	2 (12.5)	9 (64.3)	11 (36.7)
Self-perceived Health			
Excellent	2 (12.5)	2 (14.3)	4 (13.3)
Very Good	4 (25.0)	5 (35.7)	9 (30.0)
Good	8 (50.0)	5 (35.7)	13 (43.3)
Fair	1 (6.3)	1(7.1)	2 (6.7)
Poor	1 (6.3)	1(7.1)	2 (6.7)
Use of Medication to control blood pressure			
Yes	15 (93.8)	0 (0.0)	15 (50.0)
No	1 (6.3)	14 (100.0)	15 (50.0)

Abbreviation: BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); n, number of participants

[1] All data are participant-reported.

[2] Sample sizes may total less than 30 as participants had the option of not answering a question.

4.3.2 Knowledge and concern

All participants in both groups scored over 9 points (score range = 9 to 14; maximum score = 18). Hence, overall they were considered moderately knowledgeable. The majority of the hypertensive group (68.8%) scored ≥ 12 compared to the normotensive group (42.9%). However, correct responses regarding certain issues (i.e. some food sources and recommended intake of sodium) were very low in both groups (Table 4.3).

Table 4.3 presents a summary of responses to the assessment of knowledge related to dietary sodium by participant's hypertension status.

Table 4.3: Knowledge of sodium intake as a health issue and sources of sodium by hypertensive group (hyp=hypertensive group and norm=normotensive group)

Parameter	Hyp (%)	Norm (%)
How much sodium do you think Canadians consume (too much, the right amount or too little)?		
Too much	87.5	71.4
How much sodium is recommended for the average Canadian each day?		
1200 – 1500 mg/d	18.7	14.3
Don't know	81.3	85.7
Which of the following do you think is the single largest source of sodium?		
Salt in processed foods	93.8	57.1
Sea salt is healthier than table salt.		
Agreed	62.5	92.9
Disagreed	37.5	7.1
Correctly identified high-sodium foods		
Processed meats (i.e. wieners, bacon or sandwich meat)	100.0	100.0
Pickled foods (i.e. olives, pickles)	87.5	57.1
Cheese (processed)	50.0	14.3
Canned soup	100.0	100.0
Salad dressing	43.7	50.0
Canned vegetables or juice	31.7	7.2
Frozen dinners	87.5	71.4
Correctly identified medical conditions associated with high sodium intake		
High blood pressure	100.0	100.0
Heart disease	100.0	85.7
Stroke	87.5	78.6

Over 70% of participants in both groups were aware that Canadians consume too much sodium. Yet less than 10% of the participants in both groups believed they personally consumed too much sodium. While more than 90% of the hypertensive group and 50% of the normotensive group knew that processed foods were the largest source of sodium in the Canadian diet, many participants were not able to correctly identify many of the high-sodium foods in the mainstream Canadian diet. More specifically, over 50% of the

participants in both groups were not able to identify the following foods as being high in sodium: processed cheese, canned vegetables or juice and salad dressing.

Likewise, more than three quarters of the participants failed to answer the recommended amount of daily sodium intake (which is 1500 mg/d) for the average Canadian. However, 75% of the hypertensive and 78.6% of the normotensive participants believed that they were consuming the right amount of sodium.

Approximately one third of the participants in both groups (31.3% hypertensive; 28.6% normotensive) were concerned about the sodium content in their diet. Only 18.8% of the hypertensive group reported monitoring the amount of sodium while purchasing food compared to 28.6% in the normotensive group.

4.3.3 Food purchasing behaviour

All the participants from both groups reported shopping at a grocery store at least once per week. However, 25% of the hypertensive and 55% of the normotensive group reported shopping at a grocery store at least three times per week (or "whenever they need something").

When describing their grocery shopping behaviour, participants reported making a list before going to the grocery store (81% hypertensive; 78.6% normotensive). Some participants also reported buying whatever was on sale (0% hypertensive; 35.7% normotensive). In addition, 38% of hypertensive and 35.7% of normotensive participants reported going off the list and buying whatever they liked on the shelves.

4.3.3.1 Frequency of reading the nutrient facts table (NFT)

Participants reported the frequency of reading the NFTs while purchasing a food item for the first time on a 0 to 4 point scale (where 0=never and 4=always). Responses were dichotomized based on responses: "3 or 4" = "read NFT" and "0, 1 or 2" = "don't read NFT". The mean score for both groups was 2.9 which suggest that on average the participants "usually" read the NFT. About 68.8% of the hypertensive and 78.6% of the normotensive group reported "always" or "usually" reading the NFT.

Figure 4.1 represents the frequency of reading nutritional values for certain nutrients including sodium. The hypertensive group reported reading nutritional values for sugar (mean score=2.7) more often than sodium (mean score=2.1). The normotensive group reported reading nutritional values for calories and sodium more often than the other nutrients.

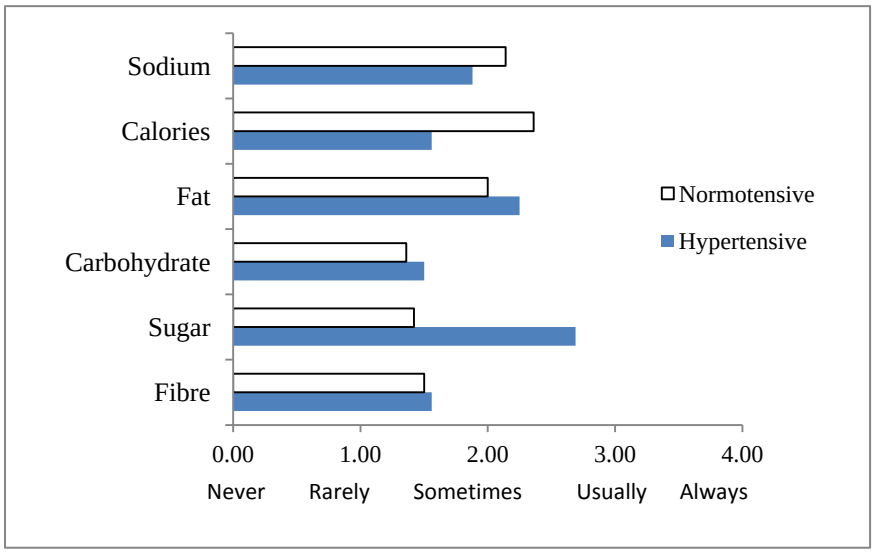

Figure 4.1: Frequency of reading the NFT for different nutrients by the hypertensive and normotensive groups. Participants (n=30) reported their frequency of reading NFT on a 0 to 4 scale.

Whereas 56.3% of the hypertensive and 64.3% of the normotensive participants reported comparing the sodium contents among different brands, almost half of the participants (43.8% hypertensive; 42.9% normotensive) reported having difficulty understanding the information on food nutritional labels. More than 80% of the participants in both groups reported focusing on the amount of a nutrient given in grams/milligrams rather than % DV while looking at the NFT. Although participants were more likely to read the NFT for sodium content and a majority of participants (68.8% hypertensive; 57.1% normotensive) were willing to choose a product marked with a "low sodium label", almost all participants reported not paying attention to sodium content of food when eating at a restaurant.

4.3.3.2 Sodium reducing behaviours

Although almost all the participants reported not being advised by a health professional regarding sodium reduction in their diet because of a medical condition, more than half of the participants in both groups (62.5% hypertensive; 57.1% normotensive) reported taking action on a regular basis to control/reduce salt or sodium intake. Of those who reported taking action, many of them considered not adding salt at the table (50% hypertensive; 50% normotensive), avoiding processed foods (50% hypertensive; 35.7 % normotensive), and reading the NFT (43.8% hypertensive; 42.9% normotensive) in order to control their sodium intake (Figure 4.2).

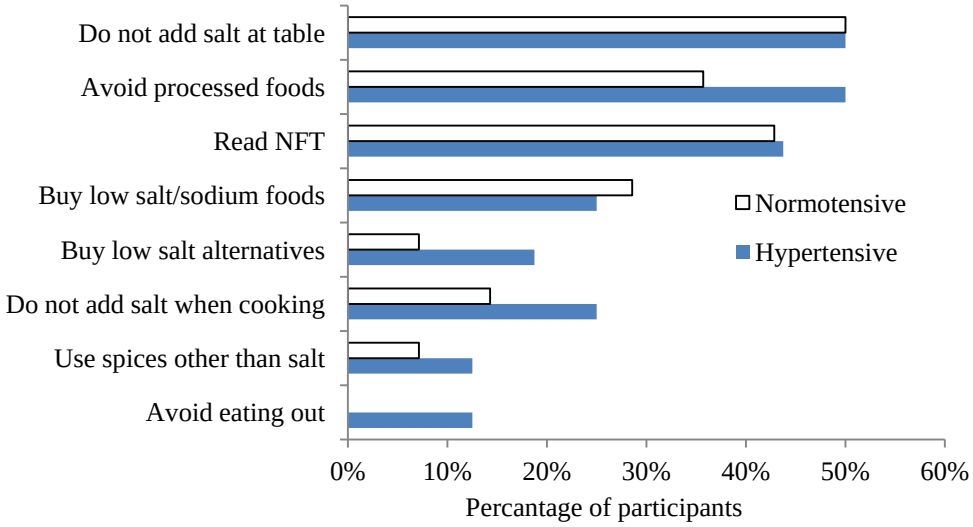

Figure 4.2: Regular actions taken by the participants to reduce salt/sodium intake. Participants (n=18) reported taking regular actions were allowed to report more than one action.

More than half of the participants (62.5% hypertensive; 50% normotensive) reported avoiding purchasing a particular food in the past month because they thought it was too high in sodium. The most common food items they avoided included prepackaged meals, canned soup, and potato chips. However, 31.3% of the hypertensive and 35.7% of the normotensive group reported not considering the level of sodium for almost all the foods they had purchased over the past month.

Overall, participants were relatively knowledgeable regarding excess dietary sodium as a health issue; however, their knowledge regarding daily recommendation and some food sources of sodium was substantially low. This knowledge gap might have a negative effect on what they buy and eat. Regardless of their knowledge in relation to dietary sodium and hypertension, the hypertensive group was not concerned regarding the sodium content in their diet. This is further evident by their behaviour, for example,

reading the NFT less often for sodium content than the other nutrients when purchasing food and not looking for information on sodium when eating out.

4.3.4 Food purchasing patterns (*from food receipts*)

A total of 201 receipts from the 30 participants showed that 28% of the receipts came from Metro, 15% from No Frills, 12% from fast-foods/restaurants and 8% from Remarks. Other stores include Angelos, Superstore, Loblaws, Freshco, Food Basics, Shoppers Drug Mart, Sobeys, Costco, Walmurt, Farmers' Market and the Church Bazar. A total of 1,221 food items were represented by the receipts. The amount of sodium for 61 food items (5%) could not be found and thus those food items were not included in the calculations. No missing or forgotten receipts were reported by the participants.

The mean daily sodium purchased per 1000 kcal was an average of 5719.3 mg for the hypertensive group compared to 3340.1 mg for the normotensive group. An independent-sample t-test was conducted to compare mean sodium purchased per day in the hypertensive and normotensive groups. There was no significant difference in the scores; $t(28) = 1.86$, $p = 0.07$, which suggests that hypertension status has no relation with the amount of dietary sodium purchases.

The top three food groups that contributed to total sodium purchased were prepackaged meals (18.0%), condiments (14.8%), and breads & cereal (12.2%) for the hypertensive group and cheese (12.9%), condiments (12.3%), and breads & cereal (11.9%) for the normotensive group. Figure 4.3 shows the contribution of 11 major food groups to the total sodium purchased for both groups.

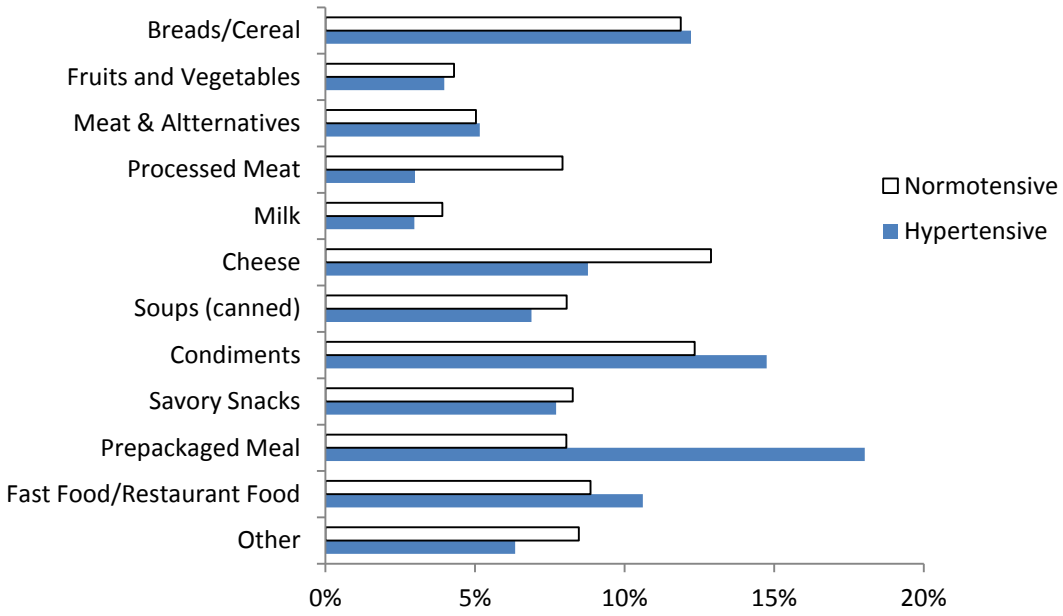

Figure 4.3: Percentage contribution of major food groups to the total sodium purchased by the hypertensive and normotensive group.

4.3.5 Hypertension status and food consumption

The average daily sodium intake for the hypertensive group (2229.0 mg/d) was slightly higher than the normotensive group (2070.1 mg/d). However, the difference between the groups was not significant [($t(28) = 0.51$, $p = 0.61$], suggesting that hypertension status has no relation with dietary sodium consumption.

The DASH score for all the participants ranged from 0.5 to 6.0. Participants with hypertension had a lower mean DASH score (1.8 versus 4.3) than normotensive participants, [$t(28) = -4.68$, $p < .001$)]. This result suggests that older adults with hypertension were very poorly adherent with the DASH diet plan.

Only 1 participant (6.3%) in the hypertensive group and 7 participants (50%) in the normotensive group were found DASH adherent (DASH score ≥ 4.5). Moreover, the DASH scores were markedly lower (DASH score range = 0.5 to 2.0) in the obese (BMI ≥ 30) hypertensive older adults (n = 5).

Table 4.4: Average intake of DASH target nutrients by hypertension status.

DASH Nutrient	Hypertensive (n=16)	Normotensive (n=14)	All (n=30)	DASH Score Target
Total Fat, % of energy	35.0	23.1	29.1	27
Saturated Fat, % of energy	11.8	6.8	9.3	6
Protein, % of energy	14.5	15.8	15.2	18
Cholesterol, mg/1000 kcal/d	186.8	89.0	137.9	71.4
Fibre, g/1000 kcal/d	12.6	17.8	15.2	14.8
Magnesium, mg/1000kcal/d	120.5	157.2	138.8	238
Calcium, mg/1000 kcal/d	415.8	427.9	421.8	590
Potassium, mg/1000 kcal/d	1361.1	1597.2	1479.2	2238
Sodium, mg/1000 kcal/d	1570.9	1450.0	1505.5	1143

Table 4.4 represents participants' average intake of DASH target nutrients by their hypertension status. In both groups, average intake for sodium (mg/1000 kcal/d) was higher than the DASH intermediate target which is 1286 mg/1000 kcal (Table 4.4).

For the hypertensive group, the percentage of participants with DASH nutrient intake was poorest for total fat and cholesterol (12.5% each) and best for fibre intake (62.6%), followed by calcium and potassium (43.8% each) (

Table 4.5).

Table 4.5: Percentage of participants meeting DASH nutrient intake by hypertension status.

	DASH-Accordant Nutrient Intake by Hypertension Status		
DASH Nutrient	All (%)	Hypertensive (%)	Normotensive (%)
Total Fat	50.0	12.5	92.8
Saturated Fat	63.4	37.5	92.8
Protein	23.3	18.8	28.5
Cholesterol	33.4	12.5	57.2
Fibre	60.0	62.6	57.1
Magnesium	33.3	18.8	49.8
Calcium	43.3	43.8	42.8
Potassium	40.0	43.8	35.7
Sodium	36.7	31.3	42.7
Sample Size	30	16	14

Table 4.6 represents the mean amount of daily sodium purchased and consumed (mg/1000 kcal) in relation to the following parameters: use of NFT while purchasing foods, concern regarding sodium content, actions taken to reduce dietary sodium, and knowledge score. None of these parameters showed a meaningful trend. For example, participants who were concerned regarding sodium content in their diet were buying more sodium (mg/1000 kcal/d) than those who were not concerned.

Table 4.6: The mean sodium (Na) purchased (mg/1000 kcal/d) in relation to the use of NFT, concern and knowledge of hypertensive and normotensive groups

Parameters	Na purchased (mg/1000 kcal/d)		Na consumed (mg/1000 kcal/d)	
	Hypertensive group	Normotensive group	Hypertensive group	Normotensive group
Read nutrient facts table	5904.2	4027.6	2354.1	2137.8
Did not read nutrient facts table	5575.6	2423.5	2131.7	1979.9
Concerned regarding sodium content	6936.0	4014.7	1887.4	1588.4
Not concerned regarding sodium content	4989.3	3070.3	2520.6	2262.8
Knowledgeable (score = 9 to 11)	4111.2	2613.3	2396.6	2200.8
Knowledgeable (score = 12 to 14)	6450.3	4309.1	2152.8	1896.0
Take regular actions to reduce sodium	5567.2	3469.2	2475.2	2057.6
Did not take regular actions to reduce sodium	3822.0	3168.0	1818.6	2086.9

4.4 **Discussion**

According to Health Canada, dietary sodium reduction is an important part of hypertension management. In order to help prevent or manage hypertension, dietary sodium reduction should start from the food acquisition level. Choices made during food purchasing provide valuable information on the individuals' food consumption and dietary quality (Becker, 2001). Given that prevalence of hypertension is higher in older adults and population-wide dietary sodium reduction strategies would efficiently reduce the risk of several other diseases and health care costs, the current study explored the

food purchasing and consumption behaviour in relation to dietary sodium among community dwelling older adults with and without hypertension.

The study questionnaire examined knowledge, concern and behaviour regarding sodium, whereas information from the food receipts examined the association between hypertension status and food purchasing, specifically as it related to the sodium content of items bought. This study addresses a need to understand the actual purchasing and consumption patterns of older adults with hypertension, since to date, little is known about these behaviours in older Canadians. Therefore this study addresses an important knowledge gap.

The results from the study found that the hypertensive group purchased 5719.3 mg/1000 kcal/d and consumed 2229.0 mg/d sodium, whereas the normotensive group purchased 3340.1 mg/1000 kcal/d and consumed 2070.1 mg/d. However, no significant difference was found between the hypertensive and normotensive groups in the sodium content of food purchases ($p=0.07$) and consumption ($p=0.61$), suggesting that there is no association between hypertension status and the amount of sodium purchased and consumed.

However, the current study found that older adults with hypertension had significantly lower DASH scores ($p < 0.001$) compared to those without hypertension, suggesting that the hypertensive older adult diet has not been greatly influenced by the recommendations of CHEP emerging from the DASH trial. Among the sample, only one older adult with hypertension (of a total of 16 hypertensive participants) had even modest adherence (DASH score = 5.0) with the DASH diet. This result suggests that older adults with

hypertension were not adherent with the DASH diet plan. They were consuming more of the nutrients that should be eaten less (e.g. sodium, fat) and less of the nutrients that should be eaten more (e.g. potassium, magnesium, calcium) for management of hypertension (Houston and Harper, 2008). Moreover, the DASH scores were markedly lower (DASH score range = 0.5 to 2.0) in the obese (BMI ≥ 30) hypertensive older adults who are more likely to receive the greatest benefit from the DASH diet (Lien et al., 2007).

Overall, the hypertensive group consumed and purchased more than the recommended DASH target amount of sodium which is 1143 mg/1000 kcal/d. While reducing sodium intake to the recommended level is important for both groups, these results are particularly concerning for those with hypertension. Sodium consumption higher than the recommended level will also increase complications and risk for other diseases associated with hypertension.

On the other hand, the findings from the present study questionnaire found that the participants in both groups were comperatively knowledgeable regarding sodium consumption and related health issues. However, participants were less knowledgeable regarding the sodium recommendation and also misidentified some popular foods (i.e., canned vegetables or juice, salad dressing etc.) that are high in sodium. Data from the food receipts showed that these foods were commonly purchased by the older adults. Thus, it can be proposed that this gap in knowledge is affecting the food choices of older adults and self-rated assessment of personal sodium intake. For example, more than 75% of the participants believed they were consuming the right amount of sodium. Similarly,

previous research has reported a low level of knowledge regarding sources of high-sodium foods among middle aged Ontario residents (Papadakis et al., 2010). These findings suggest a need for addressing the lack of knowledge regarding sources of sodium through education and awareness programs.

However, the present study found a discrepancy between the amount of sodium (both purchased and consumed) and the knowledge of the participants. Participants with higher knowledge scores were buying and consuming more sodium than those who had lower knowledge scores. The possible explanation for this can be either knowledge has no influence on sodium purchases and consumption, or older adults are not able (or willing) to translate the knowledge or information into health related behaviours. The current study did not assess respondents' knowledge regarding the DASH diet. However, a prospective study conducted among older adults in North Carolina found that an increase in dietary knowledge was not associated with an increase in adherence to the DASH diet (Racine et al., 2011). Therefore, the current study recommends future investigation of effective approaches to sustain the DASH dietary pattern beyond education and counselling.

Even though the participants were aware that sodium consumption was a health issue and processed foods are the single largest source of sodium in the Canadian diet, less than one third of participants in both groups were concerned about the amount of sodium in their diet. This finding is supported by the fact that despite having the knowledge, a major proportion of sodium purchased by the hypertensive group was coming from frozen dinners and ready-to-eat meals, which are high in sodium content. This might be due to

the fact that the current study was only focused on older adults since it has been found that older adults tend to choose prepared or ready-to-eat meals in order to ease their food preparation, as well as to prevent dependency on others regarding meal preparation (Sidenvall et al., 2001).

Nutrition labelling is a helpful tool for making informed food choices. In Canada, consumers can find the amount of nutrient content from the NFT. A majority of respondents reported reading NFT always or usually. However, it did not translate into the amount of sodium purchased and consumed. Participants who reported reading NFT for sodium were actually buying and consuming more sodium than those who did not read NFT. One explanation could be that participants who read NFT have difficulty understanding and utilizing the information given. Moreover, even if they understand NFT when purchasing foods, their lack of knowledge regarding the daily recommendation may interfere with the proper utilization of nutrion labelling. Hence, there is a need for adding a different reference value (other than %DV) on NFT to help consumer understand whether the food is offering little or a lot of nutrients.

A systematic review of research investigating consumer understanding and use of nutrition labelling concluded that reported use of nutrition labelling was high whereas the actual use of food labels during food purchase was much lower (Cowburn and Stockley, 2007). The review study also reported that consumers who read nutrition labels were able to understand a few terms but were confused by other types of information (Cowburn and Stockley, 2007). Almost half of the participants (43.4%) of the current study actually reported having difficulty understanding the information on food labels. The font size of

the NFT and the place where it is written (i.e. front, back or side of the food package) could be possible barriers for older adults to find the nutrition information. Thus, the current study would suggest the use of a simplified nutrition labelling on the front of the package, for example, a verbal description or a consistent symbol that identifies healthier choices.

Currently, some selected pre-packaged foods in Canada have front-of-package (FOP) nutrition labeling which are not regulated by the Government of Canada, for example, Kraft's Sensible Solution, Heart and Stroke Foundation's Health Check logo etc. (Emrich et al., 2012). Since the symbols or logo are not consistant it might create confusion among consumers. Research suggests that a standardized, simplified FOP system would enable consumers to make healthier choices given that it does not require any numeracy, literacy and nutritional knowledge (Emrich et al., 2012).

The Canadian Research Synthesis on Nutrition labelling reported that the understanding of nutrition labelling is not reaching its full potential to assist Canadians in making informed food choices despite educational efforts by Health Canada and others (Health Canada, 2013). Canadian consumers reported various factors as barriers to the use of the NFT which include factors that affect food choices (i.e. taste, price, convenience, and personal preference), lack of knowledge of individual requirements for nutrients, lack of time, interest, and trust on the information (Health Canada, 2013). Overall, the findings of the current and previous studies suggest that knowledge and understading are not sufficient to help people make healthier choices. Thus, the current study would suggest an increase in the availability of lower-sodium food options and introduction of a

mandatory policy to lessen the sodium content of processed foods in the Canadian food supply to assist in population-wide sodium reduction.

Similarly, UK Food Standards Agency (FSA) collaborated with the food industry as a means of a salt reduction program. They established voluntary targets for salt in 30 categories of processed food including bread, bacon, breakfast cereal and cheese and all sectors of food industry responded positively (Wyness et al., 2011). The targets for salt were reduced gradually in order to increase consumer acceptability since the reformulation process allowed sufficient time for consumers' palates to adjust to the lower salt levels and to the change in taste of familiar foods. As a result, the average salt intake of the UK population reduced from 9.5 g/d in 2001 to 8.6 g/d in 2008 (Wyness et al., 2011). It is assumed that the efforts across the manufacturing, retail and food service sectors to reformulate food products directly resulted in the reduction of salt intake (Wyness et al., 2011).

More than half of the participants in both groups reported taking regular actions to reduce the level of sodium in their diet. The most reported action included avoiding salt shakers at the table, avoiding processed foods and reading NFTs for sodium content. However, the actual purchase and consumption data did not match with these self reported sodium reduction behaviours. Participants who reported taking regular actions to control their sodium intake were purchasing and consuming more sodium than those who did not. Since the data are cross sectional it can not be concluded as to whether they actually reduced the amount of sodium after taking these actions. Moreover, previous studies on

dietary behaviour suggest that social approval bias may drive self-report data toward more socially acceptable responses (Hebert et al., 1995; Miller et al., 2008).

The food consumption and purchase data were collected at the same period of time in an attempt to ensure that the food purchases were reflected in dietary intake. However, it is not easy to estimate sodium intake in individuals other than measuring their urinary sodium excretion for multiple overnights (Intersalt Cooperative Research Group, 1988; Luft et al., 1982). Hence, overnight urine collection would be beneficial to estimate their actual sodium intake.

There were several limitations to the present study. A convenience sample was used, which does not necessarily represent the wider older adult community. The relatively small sample size suggests that it was not possible to explore the purchase and consumption patterns, knowledge and concerns among people of different ethnicities or socio-economic status. The study participants were exclusively female (100%) and over 65 years of age which was reflective of the higher proportion of women within the Canadian older adult population, as reported by a 2006 Statistics Canada report (Turcotte and Schellenberg, 2007). Moreover, it is a common observation that women are the principal food shoppers and primarily responsible for acquiring and preparing meals (an inclusion criterion for the study). Since the participation in the study was voluntary, it is possible that the sample was biased, for example, usually women are more interested in foods and nutrition than men and thus more likely to participate in the study. However, the study was publicized as a general food survey in order to minimize bias in participant recruitment regarding sodium awareness and purchase.

Another limitation of the study was that it did not examine the smoking patterns, alcohol consumption and physical activity level of the older adults; factors that might have affected their overall food choice and consumption behaviour. The cross-sectional nature of the study did not allow for the direct assessment of dietary modifications over time. Future prospective longer term studies are needed for providing more valuable insight on the purchase and consumption of dietary sodium. Although it was not determined as to whether the older adults with hypertension changed their sodium purchase or consumption after being diagnosed, it is unlikely that they increased their intake after being diagnosed with hypertension. Nevertheless, the current purchase and consumption level of sodium based on the self-reported hypertension status by the participants was explored. Data on older adults' hypertension status, dietary intake, knowledge and concern regarding sodium were based on self-reported data and 24-hour dietary recall, which are subject to misclassification and recall bias. Direct measurement of the parameters would have been optimal but also complicated and expensive. In addition, overweight and obese individuals are more likely to under-report their food purchase or intake compared to normal weight individuals (Johansson et al., 1998; Ferrari et al., 2002). A higher percentage of those with hypertension, compared to those without hypertension, were overweight/obese (62.5% vs. 28.6%, respectively). As a result, the findings of the present study regarding the amount of sodium purchased and consumed in the hypertensive group is likely conservative. Concern about food purchase and dietary consumption seems warranted.

Previous studies that investigated food purchasing behaviour considered a broader age demographic, focused primarily on socio-economic status and were restricted to food

purchases at the supermarket or stores (Piché and Garcia, 2001; Ricciuto et al., 2006). The current study was partly unique in the way that it focused on the purchasing behaviour in relation to sodium and hypertension status in a narrower age demographic. The study also included food purchases at grocery stores, supermarkets, fast-food places, restaurants and convenience stores. Moreover, the use of food receipts with annotation as a data collection measure is a significant strength of the study. Currently, this strategy is the most comprehensive, detailed measure of household food purchasing behaviour (French et al., 2008). The present study investigated food purchases of older adults over a two week period which may or may not reflect their usual purchases. The possible explanation is inventory effects (i.e. food already available in the household influenced what food they purchased) and temporal effects (i.e., the season and weeks of the month in which purchases were recorded) (Ricciuto et al., 2006). During any two week period, it is possible that some participants purchased many food items whereas others purchased only a few items because of stocking up or else using up existing food stocks. However, a review paper concluded that annotated food purchase receipts over a 2 to 4 week time period is best for describing household food purchasing behaviour (French et al., 2008).

The findings from the current study provide valuable information which suggests the need for a policy change regarding the reduction of sodium content of the processed and pre-packaged foods in the Canadian food supply. This strategy would be useful since it will not require any efforts at the consumer level. The current study found that more than 90% of the participants did not receive any advice from health professionals regarding sodium reduction even after being diagnosed with hypertension. If accurate this finding emphasizes the need for more involvement of health professionals, such as Registered

Dietitians, regarding dietary modification to prevent and manage hypertension. Health professionals should reinforce the importance of sodium reduction and the DASH dietary plan, help patients with goal setting and monitoring their progress over time. Previous literature shows that mutual collaboration of patients and health care professionals reduces the risk of nonadherence to treatment guidelines (Martin et al., 2005).

4.5 **Recommendations**

1. The findings from the current study provide valuable information which suggests the need for a policy change regarding the reduction of sodium content of processed and pre-packaged foods, particularly those commonly purchased by older adults, in the Canadian food supply. This strategy would be useful since it will not require any conscious efforts by consumers. 2. The current study found that more than 90% of the participants did not receive any advice from health professionals regarding sodium reduction even after being diagnosed with hypertension. This finding emphasizes the need for more involvement of health professionals regarding dietary modification to prevent and manage hypertension in addition to public health efforts. 3. The current study suggests a need for a simplified front-of-package nutrition labelling, similar to guiding stars or traffic light symbols, to enable people to make lower sodium choices at the point-of-purchase. 4. Future activities may be directed toward increasing the availability of lower sodium options in the Canadian food supply by encouraging the food industry through incentive programs so that consumers are able to reduce their sodium without putting in much effort. 5. In addition, establishing salt targets (similar to FSA (UK)) for food items commonly consumed by older adults in fast foods and restaurants would have valuable effects on

population-wide sodium reduction since older adults are not much concerned in this regard. 6. The current study also suggested a need for future research investigating an effective approach to sustain the DASH diet plan in older adults besides education and counseling.

4.6 **Conclusion**

The present study provides insights into the actual food purchase and consumption by older adults in relation to sodium and hypertension status. Having hypertension did not make any difference on the level of sodium purchased and consumed. Older adults were found to purchase and consume higher amounts of sodium than the recommended level. Moreover, the participant's knowledge and concerns regarding sodium did not show any meaningful trend towards the amount of sodium purchased and consumed. Overall, the results from the current study identified where sodium reduction strategies for this demographic should be focused. The need for further effort for sodium reduction among older adults with the involvement of health professionals and policy makers is apparent from the findings of the current study.

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APPENDIX

APPENDIX A: LIST OF RECRUITMENT PLACES

1. Kiwanis Senior Centre, London, ON
2. Hamilton Road Senior Centre, London, ON
3. VON Healthy Aging Program, London, ON
4. Local Malls and Grocery Stores, London, ON
5. Cherryhill Public Library, London, ON
6. London Public Library, London, ON
7. Boys and Girls Club, London, ON
8. Cherryhill Senior Activity Club, London, ON
9. Canadian Centre for Activity & Aging, London, ON

APPENDIX B: PARTICIPANT RECRUITMENT FLYER

Older adults (65 years and older) needed for a research study on food purchasing and consumption behaviour

- Study participants will be required to provide their grocery receipts for 2 consecutive weeks, 24- hr dietary recalls, and attend an interview with the researcher that will take approximately one hour

This research study is run out of the Department of Health and Rehabilitation Science at the University of Western Ontario

If you are interested, please contact

Asma Aktar

Phone: [redacted] or email: [redacted]

Or,

Alan Salmoni

Phone: [redacted] or email: [redacted]

Thank you!!!

APPENDIX C: PARTICIPANT ELIGIBILITY QUESTIONNAIRE

Project Title: Dietary Sodium and Hypertension Status: A Quantitative Study Exploring Food Purchasing and Consumption Behaviour of Older Adults

1. Are you over 65 years old?
   Yes No (must be Yes, ≥ 65 years old)
2. Are you living independently in the community?
   Yes No (must be Yes)
3. Are you the main shopper in your household?
   Yes No (must be Yes)
4. Are you receiving any meal-assisted service (eg. Meals on wheels)?
   Yes No (must be No)
5. How many times you usually do grocery shopping (per week) for your household?
   _____ (must be at least once/wk)
6. How many meals you usually eat at your home per day?
   _____ (must be at least two meals/day)
7. Have you ever diagnosed with hypertension by a health professional?
   Yes No

****

Notes – record phone communication, email communication and any issue.

APPENDIX D: LETTER OF INFORMATION AND CONSENT FORM

Project Title: Dietary Sodium and Hypertension Status: A Quantitative Study Exploring Food Purchasing and Consumption Behaviour of Older Adults

Principal Investigator: Alan Salmoni, PhD, Kinesiology, Western University, Canada

Letter of Information

1. **Invitation to Participate**
   You are being invited to participate in the research study on food purchasing and dietary behaviour of older adults. Your participation in the study will help us to generate valuable information on diet related behaviour in this population.

2. **Purpose of the Letter**
   The purpose of this letter is to provide you with information required for you to make an informed decision regarding participation in this research. Please take the time to read this carefully and feel free to ask the Investigators any questions if there is something that is unclear or if there are words or phrases that you do not understand.

3. **Purpose of this Study**
   The purpose of this study is to provide information on the food buying and consumption behaviour of community dwelling older adults.

4. **Who is eligible to be in the study**
   Individuals who are over 65 years old, living independently in the community, and communicate in English, shop at least once in a week at a grocery store and eat at least two main meals per day at home are eligible to participate in this study.

5. **Who is not eligible to be in the study**
   Individuals who receive any meal service or have any cognitive dysfunction are not eligible to participate in this study.

6. **Study Procedures**
   If you agree to participate, you will be asked to submit your grocery-receipts, provide a 24-hour dietary recall and attend an interview administered by the student researcher. It is anticipated that the entire task will take an hour. The task(s) will be conducted at the Cherryhill Public Library.

7. Possible Risks and Harms

There are no known or anticipated risks or discomforts associated with participating in this study.

8. Possible Benefits

You may not directly benefit from participating in this study. However, information gathered from the study may provide a better understanding of the nature of food purchasing and consumption behaviour of older adults which will allow the health educators to highlight the need for lifestyle modifications to promote healthy aging and develop health promotion programs according to the findings.

9. Compensation

You will not be compensated for your participation in this research.

10. Voluntary Participation

Participation in this study is voluntary. You may refuse to participate, refuse to answer any questions or withdraw from the study at any time with no effect on your future. You have the right to request the withdrawal of data anytime during or after the study has done.

11. Confidentiality

All data collected will remain confidential and accessible only to the investigators of this study. If the results are published, your name will not be used. If you choose to withdraw from this study, your data will be removed and destroyed from our database. Representatives of The University of Western Ontario Health Sciences Research Ethics Board may contact you or require access to your study-related records to monitor the conduct of the research. The data collected for the study will be kept for five years. After that time period data from the paper file will be cut into small pieces and the data stored in laptop and memory stick will be deleted.

12. Contacts for Further Information

If you require any further information regarding this research project or your participation in the study you may contact the principal investigator, Alan Salmoni, at [redacted] or email [redacted] You may also contact the student researcher, Asma Aktar, at [redacted] or email [redacted]. If you have any questions about your rights as a research participant or the conduct of this study, you may contact The Office of Research Ethics [redacted], email: [redacted].

13. Publication

If the results of the study are published, your name will not be used. If you would like to receive a copy of any potential study results, please provide your name and contact number on a piece of paper separate from the Consent Form.

This letter is yours to keep for future reference.

Consent Form

Project Title: Dietary Sodium and Hypertension Status: A Quantitative Study Exploring Food Purchasing and Consumption Behaviour of Older Adults

Study Investigator's Name: Alan Salmoni, Asma Aktar

I have read the Letter of Information, have had the nature of the study explained to me and I agree to participate. All questions have been answered to my satisfaction. (You do not waive any legal rights by signing this consent document)

Participant's Name (please print):
_____

Participant's Signature:
_____

Date:
_____

Person Obtaining Informed Consent (please print): _____

Signature: _____

Date: _____

APPENDIX E: CERTIFICATE OF ETHICS APPROVAL

Western Research

Research Ethics

Use of Human Participants - Initial Ethics Approval Notice

Principal Investigator: Dr. Alan Salmoni
File Number:104368
Review Level: Delegated
Protocol Title: Food purchasing and consumption behaviour of Canadian older adults with and without hypertension
Department & Institution: Health Sciences\Kinesiology,Western University
Sponsor:
Ethics Approval Date: November 07, 2013 **Expiry Date:**August 30, 2014
Documents Reviewed & Approved & Documents Received for Information:

Document Name	Comments	Version Date
Instruments	24-Hour Dietary Recall	
Western University Protocol		
Recruitment Items	Participant recruitement flyer	2013/10/22
Letter of Information & Consent		2013/10/22
Instruments	interview questionnaire	2013/10/22

This is to notify you that The University of Western Ontario Research Ethics Board for Health Sciences Research Involving Human Subjects (HSREB) which is organized and operates according to the Tri-Council Policy Statement: Ethical Conduct of Research Involving Humans and the Health Canada/ICH Good Clinical Practice Practices: Consolidated Guidelines; and the applicable laws and regulations of Ontario has reviewed and granted approval to the above referenced revision(s) or amendment(s) on the approval date noted above. The membership of this REB also complies with the membership requirements for REB's as defined in Division 5 of the Food and Drug Regulations.

The ethics approval for this study shall remain valid until the expiry date noted above assuming timely and acceptable responses to the HSREB's periodic requests for surveillance and monitoring information. If you require an updated approval notice prior to that time you must request it using the University of Western Ontario Updated Approval Request Form.

Members of the HSREB who are named as investigators in research studies, or declare a conflict of interest, do not participate in discussion related to, nor vote on, such studies when they are presented to the HSREB.

The Chair of the HSREB is Dr. Joseph Gilbert. The HSREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000940.

Ethics Officer to Contact for Further Information

✓ Erika Basile (ebasile@uwo.ca)	Grace Kelly (grace.kelly@uwo.ca)	Vikki Tran (vikki.tran@uwo.ca)

This is an official document. Please retain the original in your files.

APPENDIX F: FOOD ITEM SPECIFICATION FORM

Please provide the following information for any food item you bought for which the details cannot be identified from the receipts. Please also enter the food item for which you were not provided any receipts. (First two rows are examples provided for your convenience)

For the week of: _____ Identity no. ___

Name of food item	Date purchased	Manufacturer name	Specification
Eg. Frozen dinner	*Nov 12/2013*	*Krafts*	*Salisbury steak*
Eg. Cream Cheese	*Nov 13/2013*	*Philadelphia*	*Low fat*

APPENDIX G: 24 HOUR DIETARY RECALL

Identity no.: _____

Please answer the following questions:

1. Please enter today's date
   _____/_____/_____
   Day Month Year
2. Which day of the week does this record? Please tick one:
   Sun ___ Mon ___ Tues ___ Wed ____ Thurs ____ Fri ____ Sat _____
3. Is this a typical day? Please tick one: Yes ____ No _____

24 Hour Record		
Time	Quantity eaten	Details of food and drink

APPENDIX H: INTERVIEW QUESTIONNAIRE

Title: Dietary Sodium and Hypertension Status: A Quantitative Study Exploring Food Purchasing and Consumption Behaviour of Older Adults
Principal Investigator: A. Salmoni
Student investigator: Asma Aktar

Identity no.: _____

Food purchasing behaviour:

Q1. How often do you buy the groceries in your household?

_____day(s)/week

Q2. How would you describe your grocery shopping behaviour?

Make a list before going to the grocery stores *(If yes, who makes the list?)*
Buy whatever looks attractive on the shelves
Buy whatever is on sale
Other

Q3. The first time you purchase a food product, how often do you read the Nutrition Facts Table on the package?

Always Usually Sometimes Rarely Never Don't know

Q4. For the food products you purchase, how often you typically look at the following information in the Nutrition Facts Table?

How about information on …

	Always	Usually	Sometimes	Rarely	Never	Don't know
a. Fats						
b. Calories						
c. Carbohydrates						
d. Sodium						
e. Sugar						
f. Fibre						

Q5. How concerned are you about the amount of sodium in your diet?

Extremely concerned
Very concerned
Moderately concerned
Not very concerned
Not at all concerned

Q6. How closely do you monitor the amount of sodium while purchasing foods?

Extremely closely
Very closely
Moderately closely
Not very closely
Not closely at all

Q7. How much sodium do you think you consume?

Far too much
Too much
The right amount
Too little
Far too little
Don't Know

Q8. How much sodium do you think most Canadians consume?

Far too much
Too much
The right amount
Too little
Far too little
Don't Know

Q9. How much dietary sodium is recommended for the average Canadian each day?

- _____

Q10. When you look at the information on the Nutrition Facts Table, do you usually focus on the amount of a nutrient in grams or milligrams, the % daily value, or both?

Amount in grams or milligrams
% Daily value
Both
If volunteered: don't read labels
Don't know

Q11. (If at least rarely in Q4) When you look at the amount of *sodium* on the Nutrition Facts Table, do you usually focus on the amount listed in grams or milligrams, the % daily value, or both?
Amount in grams or milligrams
% Daily value
Both
Don't know

Q12. Over the past month, can you think of an occasion when you decided to avoid purchasing a particular food because you thought it was too high in sodium?

Yes No

Q13. If yes, which product?

- _____

Q14. Thinking for a moment about all the food you have purchased in the past month, how often did you consider the level of sodium the food contained before buying it?

For almost all of the food products you bought
For about three quarters of the food products you bought
For about half of the foods you bought
For about a quarter of the foods you bought
For almost none of the foods you bought

Q15. Which of the following do you think is the single largest source of sodium in the form of salt in the Canadian diet:

Salt added at the table
Salt in home cooking
Salt in processed foods
Salt in restaurant foods
Don't Know

Q16. For each of the following types of food, please tell me if you think it contains a high, moderate, or a low level of sodium.

Types of food	High	Moderate	Low	Don't know
a. Processed meats such as wieners, bacon or sandwich meat				
b. Fresh Vegetables				
c. Pickled foods such as olives, or pickles				
d. Cheese (processed)				
e. Fresh meat or fish				
f. Salad dressing				
g. Canned soup				
h. Canned vegetables or juice				
i. Frozen dinners				

Q17. For each of the following types of medical conditions, please tell me if it is or is not associated with high sodium intake?

Types of medical conditions	Associated with high sodium intake	Not associated with high sodium intake	Don't know
High Blood Pressure			
Osteoporosis			
Arthritis			
Heart Disease			
Stroke			
Diabetes			

Q18. How much do you agree or disagree with the statements below. Please indicate your agreement using the following terms; strongly agree, agree, disagree or strongly disagree. The first statement is…

	Strongly disagree	Disagree	Agree	Strongly agree	Don't know
a. Lower sodium choices do not exist for many products.					
b. Sea salt is healthier than table salt					
c. When purchasing a food product, I tend to compare sodium content when looking at different brands					
d. I am more likely to choose a product which is marked with a "low sodium" "or "lower sodium" label on the front					
e. Around 80 per cent of sodium in the average Canadians diet comes from processed food					
f. I find the information on food nutritional labels difficult to understand					
g. When I go to restaurants I usually ask staff for information on the amount of sodium in menu items					

Q19. Do you do anything on a regular basis to control your salt or sodium intake? If no, please skip to Q22.

Yes No Don't know

Q20. (Ask if Q23=1) What do you do? (Pre-Coded **open end**)

Avoid/Minimize consumption of processed foods
Look at Nutrition Facts Tables on food
Do not add salt at the table
Buy low salt and low sodium foods
Buy low salt/sodium alternatives (ie mrs. Dash)
Do not add salt when cooking
Use spices other than salt when cooking
Avoid eating out
Other (specify) _____

Q21. If yes, what do you do (please check all that apply) and describe the level of difficulty in carrying out these activities as; very difficult, not too difficult, relatively easy or very easy? Please specify the reason.

	Very difficult	Not too difficult	Relatively easy	Very easy	Reason
Avoid/Minimize consumption of processed foods					
Look at Nutrition Facts Tables on food					
Do not add salt at the table					
Buy low salt and low sodium foods					
Buy low salt/sodium alternatives					
Do not add salt when cooking					
Use spices other than salt when cooking					
Avoid eating out					
Other (specify)_____ _____					
Don't Know					

Q22. Compared to other people your age, would you say your eating habits are generally:

Excellent Very good Good Fair Poor Don't know

Q23. Has a doctor, dietitian or nurse ever advised you to reduce salt or sodium in your diet (or DASH Diet) because of a medical condition that you have?

Yes No Don't Know

If yes, who and why:

Demographics:

a. How old are you? ____ yrs

b. What is your gender? Male Female

c. What is your height? ___ ft ___in (__ cm)

d. What is your weight? ___lb (___ kg)

Prefer not to answer

e. What is your recent blood pressure: ___/___ mmHg

f. What is the highest level of education you have completed?

Elementary school
High school
Community college/technical college/CEGEP
Completed university
Post-graduate degree
No schooling
Prefer not to answer

g. How many individuals, including yourself, currently live in your household?

- _____

h. To which ethnic or cultural group would you say that you belong?

- _____

i. Please tell me which of the following categories applies to your total household income for the year 2013?

Less than $40,000
$40,000 up to $75,000
$75,000 up to $100,000
$100,000 up to $150,000
$150,000 and over
Prefer not to answer

j. Average number of meals eaten at fast food/restaurants: ____ per week or ___ per day

k. For how many people you do the grocery shopping? _____

l. Who does the cooking in your household?
You
Your spouse
Other

m. Are you diagnosed with any of the following chronic diseases by a physician (If yes, please specify **when** you were diagnosed for the specific disease):
Hypertension
Cardiovascular disease
Diabetes
Others
Prefer not to answer

n. Do you take medication for hypertension? Yes No

Thank you for your participation!

CURRICULUM VITAE

Name: Asma Aktar

EDUCATION

2012-2014 Masters of Science
Health & Rehabilitation Science
Western University, London, ON

2009-2012 Honours Specialization in Nutrition & Dietetics
Food & Nutrition, Brescia University College
Western University, London, ON

RELATED EMPLOYMENT

2012-2014 Graduate Teaching Assistant
Western University, London, ON

2011-2014 Research Assistant
Western University, London, ON

CONFERENCE PUBLICATIONS

- **Aktar, A.,** Salmoni, A., Dietary and food purchasing behaviour of older adults with and without hypertension. *42nd CAG Conference*, Halifax, NS, Oct 17-19 (2013).
- Giroux, I., **Aktar, A.,** Coates, V., Dey, P., Mathyssen, J., Colby, P., and Hramiak, I., Perceived recommendation and adequacy of intake of vegetables and fruit consumption within a population with prediabetes in London, Ontario. *Dietitians of Canada Annual Conference*, Toronto, ON, Jun 14 – 15 (2012).

HONOURS AND AWARDS

2013 Margery Boyce Scholarship
The Canadian Association on Gerontology
Western University, London, ON

2012 Cathrine Powell Mcdonald Award
Brescia University College
Western University, London, ON