

UNIVERSITY OF GHANA
COLLEGE OF HEALTH SCIENCES

**ASSOCIATION BETWEEN CALORIC INTAKE AND WORK
RELATED STRESS AMONG NURSES IN TWO DISTRICT LEVEL
HOSPITALS IN MAMPONG-AKUAPEM OF THE EASTERN
REGION OF GHANA**



**A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE
STUDIES IN PARTIAL FULFILMENT OF THE AWARD OF
DEGREE OF MASTER OF SCIENCE IN DIETETICS**

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DECLARATION

This is to certify that this thesis is as a result of an independent research undertaken by Nagumsi Nuhu under the supervision of Dr. Charles A. Brown and Dr. Joana Ainuson-Quampah towards the award of Master of Science Degree in Dietetics at the Department of Nutrition and Dietetics, School of Biomedical and Allied Health Sciences, College of Health Sciences, University of Ghana.

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ABSTRACT

Background: Stress has often been related to a multitude of negative human behaviours and many health conditions including cardiovascular diseases. In recent times, several harmful dietary practices such as unhealthy eating patterns have been associated with issues of stress. Work-related stress (WRS) is experienced when the demands of the work environment exceed the employees' ability to cope with (or control) them. Nursing is generally perceived as a stressful and demanding profession. A review of employee stress in healthcare settings across 17 countries found that nurses in the majority of countries experience high levels of occupational stress.

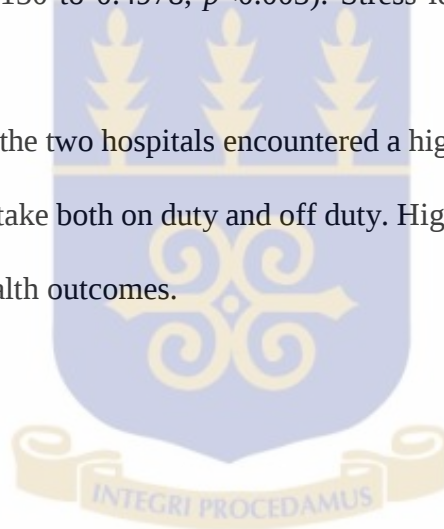
Aim: This study assessed the association between WRS and caloric intake among nurses in two district level primary care hospitals in Mampong-Akuapem of the Akuapem North Municipality of the Eastern Region, Ghana.

Methods: The study was cross sectional with a convenient selection of 85 nurses from the two hospitals, Tetteh Quarshie Memorial Hospital (public) and Bryan Lowe Orthopedic Hospital (private). Stress levels for both on and off duty periods were measured. Physiological level of stress using the Salimetrics cortisol assay in saliva and psychological levels of stress using the Cooper's Life-Stress Inventory were measured. Caloric intake was determined by a food frequency questionnaire (FFQ) as well as a four day (two week days and two weekends) 24-hour recall. The body mass index (BMI) of the nurses was also determined. Stress levels were compared to caloric intake and BMI using the Pearson's correlation test. Variations in stress levels among various ranks of nurses was also analysed.

Results: The average age of the nurses was 34.86 ± 6.27 years. Their BMI ranged from $17.96 - 34.82 \text{ kg/m}^2$ with a mean of $26.11 \pm 2.96 \text{ kg/m}^2$. Majority of the nurses (52.9%) were in the WHO classification of overweight.

The nurses consumed animal source proteins daily, more frequently than any other food group (4 days out of 7) but also consumed soft drinks 3 three days out of 7. Mean caloric intake off duty (2368.74 ± 259.67 kcal) was significantly higher ($p < 0.0001$) compared to that on duty (1784.80 ± 402.84 kcal). The nurses also recorded significantly higher (all $p < 0.001$) mean physiological stress scores (61.18 ± 7.42 versus 17.12 ± 7.15) and salivary cortisol levels (11.79 ± 1.06 $\mu\text{g}/\mu\text{l}$ versus 5.10 ± 1.02 $\mu\text{g}/\mu\text{l}$) when on duty compared to when off duty. However, significantly positive correlations were observed with total caloric intakes and salivary cortisol levels whether the nurses were on duty ($R = 0.5850$, 95% confidence interval 0.4248 to 0.7096, $p < 0.0001$) or off duty ($R = 0.3185$, 95% confidence interval 0.1130 to 0.4978, $p < 0.003$). Stress levels were highest among staff nurses.

Conclusion: Nurses of the two hospitals encountered a high stress whiles on duty and this affected their caloric intake both on duty and off duty. High caloric intake could influence their nutritional and health outcomes.



DEDICATION

I dedicate this work to almighty Allah for His blessings and mercy throughout this period of study.



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LIST OF ABBREVIATIONS

µg	Micro gram
µl	Micro litres
ACTH	Adrenal corticotrophin Hormone
AIDS	Acquired immunodeficiency syndrome
APRNS	Advanced Practicing Registered Nurses
BLOH	Bryan Lowe Orthopaedic Hospital
BMI	Body Mass Index
CRH	Cortisol releasing Hormone
DDNS	Deputy Director of Nursing Services
EN	Enrolled Nurse
FFQ	Food Frequency Questionnaire
g	Gram
GHS	Ghana Health Service
HCA	Health Care Assistant
HIV	Human Immune Virus
HPA	Hypothalamic-Pituitary-Adrenal Axis
HRP	Horse Radish Peroxide
ILO	International Labour Organisation
Kcal	Kilocalories
LPNs	Licensed Practical Nurses
LVNs	Licensed Vocational Nurses
MW	Molecular weight
N	Number
NO	Nursing Officer

PEN	Principal Enrolled Nurse
RDI	Recommended Daily Intake
SD	Standard deviation
SEN	Senior Enrolled Nurse
SN	Staff Nurse
SPEN	Superintendent Principal Enrolled Nurse
SPSS	Statistical Package for Social Sciences
SSN	Senior Staff Nurse
TMB	Tetra Methyl Benzidine
TQMH	Tetteh Quarshie Memorial Hospital
TSST	Trier Social Stress Test
WRS	Work Related Stress

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

Stress is the reaction of our bodies, souls and minds to various social, physical and emotional pressures of life when the body cannot cope (Selye, 1956). Stress is an important physiological response of the body when it is subjected to the demands of everyday endeavour. It is often related to a multitude of negative human behaviours (Habhab *et al.*, 2008).

Several studies have investigated the relationship between stress and many health conditions such as cardiovascular diseases (Ohman, *et al.*, 2007), diabetes (Ohman *et al.*, 2007) and cholesterol levels (Coleman *et al.*, 1998; Van Doornen and Orlebeke, 1982). Several authors (Macht, 2008; Torres and Nowson, 2007; Gibson, 2006) have also examined the role and the different kinds of stress in relation to quantities and types of food consumed. However, not much attention has been paid to occupation/job specific stressors and related effects of dietary habits of individuals. The demands of different occupational engagements place different stressors on individuals. According to a report by Greeno and Wing (1994), the response to these stressors may be different between populations in different classes of occupation and even among individuals of the same population. They also concluded that physiological, environmental, and psychological factors interact to produce different stress reactions among individuals.

Stress has been regarded as an occupational hazard since the mid-1950s (Kahn *et al.*, 1964).

Work-related stress (WRS) is experienced when the demands of the work environment exceed the employees' ability to cope with (or control) them (European Agency for Safety and Health at Work, 2002). It is the response people may have when presented with work demands and pressures that are not matched to their knowledge and abilities and which challenge their ability to cope. In fact, WRS has been cited as a significant health problem (House 1981; Caplan *et al.*, 1980).

A stable and productive health service is of vital importance to any country. This includes the nursing profession which comprises by far the greatest component of this service section. Nursing is generally perceived as a stressful and demanding profession. A review of employee stress in healthcare settings across 17 countries found that nurses in the majority of countries experience high levels of occupational stress (Lambert and Lambert, 2001). Huber (1995) found that, workplace stress had a negative effect not just on nurses' health but also on their job satisfaction and the overall quality of care. Workplace stress also increased the number of sick leave taken, employee turnover and number of accidents.

The role of nursing is associated with multiple and conflicting demands imposed by nurse supervisors and managers, and by medical and administrative staff. Such a situation appears to lead to work overload and possible to role conflict. One form of such conflict often mentioned in surveys of nurses relates to the conflict inherent in the instrumental and goal-oriented demands of "getting the patient better" and those related to providing emotional support and relieving patient stress (Cox *et al.*, 1996).

Role conflict of this kind may be most obvious when dealing with patients who are critically ill and dying. Indeed, one of the areas of nursing that has attracted particular attention has been critical or intensive care nursing.

Many studies on stress in nursing have attempted to measure, or have speculated on, the effects of such stress on nurses' health and well-being. There appears to be general agreement that the experience of WRS generally detracts from the quality of nurses' working lives, increases minor psychiatric morbidity, and may contribute to some forms of physical illness, with particular reference to musculoskeletal problems, stress and depression (Cox *et al.*, 1996). Therefore, in order to obtain good service delivery from nurses and achieve an improved health service for all, it is of importance to examine how caloric and nutrient needs of nurses are not only adequately met but also efficiently replenished. It is also thought that their job demands (workplace stress) have effects on their food habits (food choices, amounts, kinds, frequency and eaten times) (Cox *et al.*, 1996).

1.2 PROBLEM STATEMENT

Stress affects the diet and eating pattern of people. When an acute stress is experienced, such as a threat to personal safety for example, there is an instant physiological response, the "flight or fight" response (Wardle-Gibson, 2002) which results in the suppression of appetite (Charmandari *et al.*, 2005). For others, the typical response to chronic stressful situations is not to avoid food but rather to seek out and consume energy dense foods (Schiffman *et al.*, 2000; Oliver *et al.*, 2000). If such chronic stresses, for example, are experienced by nurses in relation to their job, they may result in excessive food consumption which may eventually culminate in weight gain and obesity with their related health consequences.

Most literature tend to consider other professions such as bankers often as being highly stressful with little attention to health professionals such as nurses (Landsbergis *et al.*, 1998; Hellerstedt and Jeffery, 1997). Nurses are often thought to possess adequate knowledge and sufficient information pertaining to health (especially in the area of their diet). However, conditions and emotions such as anxiety, depression, uneasiness, anger, apathy and alienation that commonly accompany chronic stress (Cohen, 2000) have been associated with the nursing profession. This may possibly be due to their involvement with patients and the varied responses required as well as other demands of that vocation.

The number of relevant studies in this area has been very limited. Moreover, most of the research in this area have been carried out within western culture settings, with little research being conducted in Ghana. It remains unclear if the findings in those settings are applicable to Ghanaian nurses.

1.3 SIGNIFICANCE OF STUDY

There is an important link between stress and nutrition. A balanced nutrition plays an important role when humans are under stress. When stress occurs, a well-balanced nutrition boosts resistance against the effects that stress brings upon the body (Walcott, 1995). In addition, when under stress, the nutrients consumed are drained at a much quicker rate than they are normally (Torres and Nowson, 2007).

Work Related Stress (WRS) in the absence of adequate coping resources can lead to severe mental or physical illness, and finally to a decrease in health related quality of life and service provision (Cox and Griffiths, 1996).

This study will hence provide important baseline information required by dieticians and other related health professionals to design a targeted diet and lifestyle intervention to improve dietary habits and consequently nutritional status of nurses. The right nutrition can reduce the impact that stress has on the body and effectively repair any damage that has been done prior to this. What adequate nutrition also does is prepare the body for stress that may be thrust upon the body in the future. The study will also augment the limited literature in this sector in Ghana and will also serve as good foundation for further research in this area.

1.4 HYPOTHESIS

There is no relationship between work related stress and dietary habits among nurses in the two district level hospitals.

1.5 AIM

The aim of the study was to assess the association between caloric intake and work related stress among nurses in two district level hospitals (Tetteh Quarshie Memorial Hospital and Bryan Lowe Orthopedic Hospital) in Mampong-Akuapem of the Akuapem North Municipal Assembly of the Eastern Region, Ghana.

1.6 SPECIFIC OBJECTIVES

The specific objectives were to:

1. Determine the ranks of nurses and their levels of stress.
2. Measure physiological levels of stress among the nurses by determination of cortisol in saliva.
3. Determine total daily caloric intake of the nurses during duty and off-duty hours.
4. Determine how stress affects total daily caloric intake and BMI status.
5. Assess psychological levels of stress among the nurses in relation to caloric intake.

CHAPTER TWO

LITERATURE REVIEW

2.1 STRESS

Stress can be defined as “the generalized, non-specific response of the body to any factor that overwhelms, or threatens to overwhelm, the body's compensatory abilities to maintain homeostasis” (Sherwood, 2001). The experience of stress represents a psychological state. It can result from exposure, or threat of exposure, both to the more tangible workplace hazards and to the psycho-social hazards of work. The experience of stress is one important outcome of exposure to the hazards of work and to hazardous situations. Those hazards of work which are associated with the experiences of stress are often termed stressors (Cox and Griffiths, 1996).

The following stressors can induce a stress response: physical stressors (trauma, surgery, intense heat or cold); chemical stressors (reduced oxygen supply, acid-base imbalance); physiological stressors (heavy exercise, hemorrhagic shock, pain); psychological or emotional stressors (anxiety, fear, sorrow); and social stressors (personal conflicts, change in life style) (Sherwood, 2001). Stressors can be short-term (acute stress) or occur on a daily basis (chronic stress).

2.2 WORK HAZARDS, STRESS AND HEALTH

A work hazard is an aspect of the work situation, or an event, which carries the potential for harm. Work hazards can be broadly divided into (1) the physical, which include the biomechanical, chemical, microbiological and radiological, and (2) the psycho-social Cox *et al.*, 1996).

Psycho-social hazards are those which relate to the interactions among job content, work organization, management systems, environmental and organizational conditions, on one hand, and workers' competencies and needs, on the other. Those interactions which prove hazardous influence workers' health through their perceptions and experience (ILO, 1986). Exposure to both types of hazard may threaten psychological and physical health.

The evidence suggests that their effects may be mediated by at least two pathways: first, a direct physicochemical mechanism, for example, as in the effects of infection with the human immuno-deficiency virus (HIV) as a contributory factor in AIDS; and second, a psycho-physiological stress mediated mechanism, for example, as in the effects of perceived loss of control as a possible contributory factor in coronary heart disease. These two mechanisms do not offer alternative explanations of the hazard-health relationship; in most hazardous situations, both operate and interact to varying extents and in various ways (Levi, 1981). Examples of such interactions may exist in relation to work-related upper limb and back disorders in nurses, where a combination of physical load, stress and muscle tension may contribute to the onset of those problems, or in relation to exposure to organic solvents, which may have a psychological effect on the nurse through their direct effects on the brain, through the unpleasantness of their smell and through fear that such exposure might be harmful (Levi, 1981). The latter can give rise to the experience of stress.

It makes the point that stress is an occupational health issue in the broadest sense and not simply a mental health problem.

In addition to anxiety over exposure to the more tangible hazards of work, the evidence suggests that certain psycho-social characteristics of work are associated with the experience of stress and, in turn, job dissatisfaction and ill-health.

2.3 NURSING

2.3.1 Brief History

Nursing was organized under the expectation that its practitioners would accept a duty to care rather than demand a right to determine how they would satisfy this duty. Nurses were expected to act out of an obligation to care, taking on caring more as an identity than as work, and expressing altruism without thought of autonomy either at the bedside or in their profession (Reverby, 1987).. Thus, nurses, like others who perform what is defined as “women’s work” in society, have had to contend with what appears as a dichotomy between the duty to care for others and the right to control their own activities in the name of caring (Reverby, 1987). These tensions between rights and duties continue to haunt nursing to this day.

2.3.2 The Beginnings of Modern Nursing

Prior to Florence Nightingale, daughters and wives were expected to care for infirm relatives. It was not until the Crimean War (1853–1856) that Nightingale, regarded by many as the mother of modern nursing, performed the work that indelibly marked the profession and the development of health care delivery, leaving a legacy of data- driven, altruistic practice (Winkel, 2009). Nightingale violated prevailing tenets of the privileged class of England in the early 1800s to become a nurse. Her work at the British military hospital at Scutari, begun in November 1854, and was groundbreaking.

She collected data on the causes of death among the soldiers and demonstrated that a significant number were due to poor nutrition and unsanitary, toxic environmental conditions at the hospital. The changes she instigated in the hospital dramatically improved clinical outcomes (Dossey, 2009; Woodham- Smith, 1983).

Her treatise, *Notes on Nursing: What It Is and What It Is Not*, (Nightingale, 1860) defined nursing as creating the conditions for nature to take its course in healing a person - conditions such as a clean and nontoxic environment, fresh air, good nutrition, comfort, rest, and emotional support. While ostensibly deferring to the military surgeons at the hospital in keeping with gendered role expectations of the day, she used her connection with a reporter at the *London Times* to get front- page coverage of the problems at the hospital. The reports sparked public outrage, and she got the supplies, equipment, and support that she needed.

Nightingale went on to transform the British, Indian, and military health services. Nightingale also upgraded and formalized nursing education and the role of nurses. Nightingale was referred to as “the *lady* with the lamp,” because of her habit of making rounds night and day, tending to ill soldiers, and overseeing her nursing staff with a comportment that challenged the Gamp stereotype of nurses (Lynaugh, 2001, James, 2001). She established the Nightingale School of Nursing at what is now St. Thomas Hospital in England, and replaced physician oversight of nursing services with an independently funded women’s nursing organization. This work coincided with other experiments in modern nursing in Germany and France and became the model for educating nurses in Western countries. (Lynaugh, 2001, James, 2001)

In the United States, the Civil War had demonstrated the need for trained nurses, although both men and women tended to wounded soldiers on both sides of the conflict. Walt Whitman was among these untrained nurses, as were Harriet Tubman and Sojourner Truth, two women born into slavery and committed to promoting freedom and human rights as conditions necessary for a healthy nation (Carnegie, 1995).

After the war, urbanization disrupted family relationships and gender roles, opening new opportunities for women and leading to the emergence of more formalized nursing education and practice.

2.3.2 Professionalization

By the late 1800s, the professionalization of nursing was well under way. In 1873, New York City's Bellevue Hospital became the first in the country to establish a program of nursing education based on the Nightingale model. New Haven Hospital and Massachusetts General Hospital quickly followed. Between 1890 and 1900, about 400 training schools for nurses opened across the country (Birnbach, 1999). These hospital programs offered diplomas in nursing and an apprentice- style education in which students cared for patients in hospitals under the tutelage of a nursing supervisor. Later viewed as an exploitation of women, these students worked long hours, six days a week (Lynaugh, 2001).

Once they graduated, most of the new nurses sought employment in private homes. This situation persisted until the Great Depression stripped families of their ability to hire nurses. Later, the Hill - Burton Act of 1946 boosted the numbers of hospital nurses by providing funds for the construction of new hospitals across the country, giving acute care preeminence in the American health care system and initiating an unquenchable demand for hospital nurses that continues to this day (Lynaugh, 2001).

2.3.4 The Profession

2.3.4.1 Defining nursing

There are three classic definitions of nursing. Nightingale viewed nursing as activities “to put the patient in the best condition for nature to act upon him.” (Nightingale, 1860).

One hundred years later, Virginia Henderson (Henderson, 1964), an influential thinker at Columbia University Teachers College and the Yale School of Nursing, provided a definition that was adopted by the International Council of Nurses and published by the *American Journal of Nursing*. She articulated nurses' independent functions as "The unique function of the nurse is to assist the individual, sick or well, in the performance of those activities contributing to health or its recovery (or a peaceful death) that he would perform unaided if he had the necessary strength, will or knowledge. And to do this in such a way as to help him gain independence as rapidly as possible. This aspect of her work, this part of her function, she initiates and controls; of this she is a master"

Henderson's definition differentiated nurses' unique sphere of practice ("independent" functions) versus the commonly understood "dependent" functions - those that depended upon a physician's order or prescription. Henderson even defined the role of the nurse in relation to physicians and the medical regimen with a patient focus: "In addition, she helps the patient carry out the therapeutic plan as initiated by the physician." For the first time, Henderson's definition clearly articulated the legitimacy of two important health care roles that nurses had long fulfilled: caring for people at the end of life, when recovery is not possible, and promoting the health of people who are not ill (Mason, 2011).

The third important definition of nursing was included in the landmark New York State Nurse Practice Act of 1972 (New York State Education Department, 2010).

Because the definition was contained in a statute, it provided legal support for nurses' independent practice. According to the Act "The practice of the profession of nursing as a registered professional nurse is defined as diagnosing and treating human responses to actual or potential health problems through such services as case finding, health teaching, health counseling, and provision of care supportive to or restorative of life and well-being,

and executing medical regimens prescribed by a licensed physician, dentist or other licensed health care provider legally authorized under this title and in accordance with the commissioner's regulations. A nursing regimen shall be consistent with and shall not vary any existing medical regimen."

2.3.4.2 The workforce

The nursing workforce is large and diverse (Kelly, 1989). It includes registered nurses (RNs), licensed practical or vocational nurses (LPNs, LVNs), advanced practice registered nurses (APRNs), and direct care workers, such as nursing assistants and home health aides (who are seldom discussed in nursing workforce studies, as they are unlicensed) (Mason, 2011).

2.4 PSYCHO-SOCIAL HAZARDS AND STRESS IN NURSING

Contemporary theories of stress suggest that a situation which is typically experienced as stressful is perceived to involve (1) work demands which are threatening or which are not well matched to the knowledge, skills and ability to cope of the person involved, or (2) work which does not fulfill their needs, especially where those nurses (3) have little control over work and (4) receive little support at work or outside of work (Cox and Griffiths, 1994).

There appear to be nine different psycho-social characteristics of jobs, work environments and Organizations which are hazardous for most work groups. They relate to aspects of organizational function and culture, participation/decision latitude, career development, role in organization, job content, workload/work pace, work schedule, interpersonal relationships at work and work-home interface (Cox *et al.*, 1996). Under certain conditions, each of these nine characteristics of work has proved stressful and/or harmful

to health. For example, the conditions which define the hazardous nature of workload/work pace include quantitative work overload or under load, qualitative work overload or under load, lack of control over workload, high levels of pacing, lack of control over pacing, time pressures, deadlines and sustained urgency in work (Karasek, 1979).

Most studies on nurses have focused on those employed in hospitals or closely-related healthcare organizations. Of the earlier studies, it is those of Gray-Toft and Anderson which have repeatedly attracted attention. These authors identified seven major sources of stress (Gray-Toft and Anderson, 1981). These sources included, dealing with death and dying, conflict with physicians, inadequate preparation to deal with the emotional needs of patients and their families, lack of staff support, conflict with other nurses and supervisors, workload and lastly, uncertainty concerning treatment.

A somewhat similar list was compiled, about the same time, by Bailey and his colleagues (Bailey *et al.*, 1980) which included management of difficulties, interpersonal relationships with other nurses and medical staff, issues involving patient care, concerns about technical knowledge and skills, workload and career issues. This profile of problems was also reflected in the work of Leatt and Schneck, which concerned “head nurses” (Leatt and Schneck, 1980).

Ivancevich and Smith summarized those aspects of nursing which required significant physical and/or mental effort to complete (Ivancevich and Smith, 1981). They identified three principal sources of such difficulty: work overload, conflict and the working habits of head nurses or supervisors. Dewe reported a study of about 1,800 nurses in 29 hospitals in New Zealand (Dewe, 1987). He reports identifying five “stressor” factors in these data: work overload, difficulties relating to other staff, difficulties involved in nursing the

critically ill, concerns over the treatment of patients, and dealing with difficult or hopelessly ill patients. His results were completely consistent with the earlier research.

Gray-Toft and Anderson observed that the nursing role is associated with multiple and conflicting demands imposed by nurse supervisors and managers, and by medical and administrative staff (Gray-Toft and Anderson, 1981). Such a situation appears to lead to work overload and possibly to role conflict. One form of such conflict often mentioned in nursing surveys relates to the conflict inherent in the instrumental and goal oriented demands of “getting the patient better” and those related to providing emotional support and relieving patient stress. Role conflict of this kind may be most obvious when dealing with patients who are critically ill and dying, although perhaps less so when dealing with their families.

Also, each of the sources of stress, enumerated, is itself a complex amalgam of events and situations and treating them as uni-dimensional obscures both the real nature of the problem and the pattern of events. For example, dealing with a dying patient is a major concern to nurses, in general, and to critical or intensive care nurses, in particular (Dewe, 1987). However, the death of a patient is just one aspect of a more complex situation, and is almost always surrounded by other issues of patient care (Bailey et al., 1980).

The financial constraints imposed on health-care systems over the last decade or so in most countries have tended to exaggerate the problems faced by nursing staff (Dewe, 1987). This point underlines the need for an in-depth analysis of stressful situations and the interaction between stressors.

2.4 HEALTH EFFECTS OF STRESS IN NURSING

Many studies on stress in nursing have attempted to measure, or have speculated on, the effects of such stress on nurses' health and well-being (Hingley and Cooper, 1986). There appears to be general agreement that the experience of work-related stress generally detracts from the quality of nurses' working lives, increases minor psychiatric morbidity, and may contribute to some forms of physical illness. Such conclusions receive support from available governmental statistics in many countries. For example, in 1993, the United Kingdom Health and Safety Executive published a document entitled *Self-reported work-related illness*. Nurses were among those groups who reported significantly raised rates of stress and depression. These can also in turn affect body systems that relate to nutritional status of these individuals (Bhatia, 2005).

2.5 CORTISOL

Cortisol is a steroid hormone released from the adrenal cortex in response to a hormone called adrenal corticotrophin hormone (ACTH), produced by the pituitary gland (Torres and Nowson, 2007). It is involved in the response to stress; it increases blood pressure, blood sugar levels, may cause infertility in women, and suppresses the immune system. These normal endogenous functions are the basis for the physiological consequences of chronic stress - prolonged cortisol secretion causes muscle wastage, hyperglycaemia, and suppresses immune/ inflammatory responses. The same consequences arise from long-term use of glucocorticoid drugs (Torres and Nowson, 2007).

2.5.1 Level and Stress

Cortisol is a lipophilic steroid with low molecular weight (MW ~362 Dalton) (Kirschbaum & Hellhammer, 1989). Due to its low molecular weight and lipophilic nature, unbound cortisol enters cells by passive diffusion which makes it feasible to measure the free cortisol fraction in all bodily fluids. Salivary cortisol has become an invaluable tool for

both basic scientists and clinicians due to its simple, painless and non-invasive advantage (Kirschbaum & Hellhammer, 1989). Plasma (and salivary) cortisol levels rise due to circadian influences as well as perturbations in the organism's environment (i.e., stressors) [Kalman & Grahn, 2004]. Salivary cortisol levels are unaffected by salivary flow rate or salivary enzymes. There is a high correlation between serum and saliva cortisol levels (www.genwaybio.com, 2014).

2.5.2 Role in Stress Reactions

Activation of the sympathetic adrenal medullary system, with release of catecholamines (adrenaline and noradrenaline), is typical during periods of acute stress (Cohen 2000). Hyper-activation of the hypothalamic-pituitary-adrenal (HPA) axis with release of corticosteroids (cortisol), has been associated with individuals who are chronically stressed (Bjortorp, 2000).

Responses to acute or chronic stress can lead to physiological changes which include slowed gastric emptying (Bhatia, 2005) elevation of blood pressure, increase in heart rate, mobilization of energy stores and decrease in blood flow to non-essential organs, for example the digestive system, kidneys and skin (Cohen, 2000). Hormones released in response to stress can specifically affect appetite.

Noradrenaline (Halford, 2001) and corticotropin-releasing hormone (CRH) (Mehlum, 1999) have been reported to suppress appetite (Sherwood, 2001) during stress, whereas cortisol is known to stimulate appetite during recovery from stress (Takeda, 2004). The responses to acute or chronic stress also include a number of modifying behaviors such as alcohol consumption (Mehlum, 1999), smoking (Conway, 1981) and eating (Wardle-

Gibson, 2002). Since cortisol is implicated in increased appetite during stress, blood levels should relate to dietary habits during the stressed working hours.

2.5.3 Biomarker for Stress

Cortisol has long been used in human psychobiological studies as a biological marker of stress, anxiety and depression. Total and free cortisol have been measured both together (Gunnar *et al.*, 2002, O'Hara *et al.*, 1991) and separately (Dickerson and Kemeny, 2002). Free plasma cortisol itself is usually not assayed directly but via a surrogate. One commonly used free plasma cortisol surrogate is salivary cortisol (Kammerer *et al.*, 2002). Essex *et al.* (2002) have justified the use of salivary cortisol by assuming that plasma free cortisol is the only biologically active fraction.

2.5.4 Sampling from Saliva

Measuring cortisol in saliva has many advantages including the ease of sampling (Kirschbaum & Hellhammer, 1994, 2000). It is stress -free, non-invasive, and allows for frequent and rapid sampling. Trained staff and specialized equipment are not necessary and sampling can take place outside of a laboratory allowing for sampling at home and at several times throughout each day. Cortisol in saliva is stable at room temperature and the costs of handling and processing are greatly reduced.

However salivary cortisol is not without disadvantages (Weibel, 2003). Home testing often suffers from major problems with compliance (Gutteling *et al.*, 2005) and subjects may provide insufficient saliva (Huizink *et al.*, 2003) or deviate from instructions (Weibel, 2003).

Saliva provided after eating or drinking substances with low pH (i.e. fruit juices) (Goodyer *et al.*, 1996) as well as the presence of blood in saliva due to oral lesions (Ashman *et al.*, 2002) may artificially raise cortisol levels. Some disadvantages may be resolved by sound planning and rigorous follow-up.

2.6 METHODS OF STRESS ASSESSMENT

The concept of occupational stress has gained popularity during last 50 years and a number of efforts have been made by researchers to design and develop stress measuring instruments (Vagg and Spielberger, 1998). These researchers approached to assess the stressful environments in different ways for example some focused on subjective and direct measures which include dimensions related to job, while others focused on general measures which do not link sources of stress to job (Shea and Cieri, 2011). Some researchers particularly focused on manifestations/symptoms of stress e.g. depression, anxiety, burnout etc. and many others included all the above mentioned approaches in their assessment tools.

Several models have stimulated and guided the construction of a number of measures of occupational stress and strain (Abbas *et al.*, 2013). These measures are questionnaire based and focus on quantitative research methods for data collection and analysis.

2.6.1 Trier Social Stress Test

The Trier social stress test (TSST) is a brief and highly standardized laboratory stress task meant to stimulate acute cortisol response by the use of psychological stress protocols (e.g. cognitive tasks or public speaking paradigms) (Kirschbaum and Hellhammer, 1989). It is characterized by uncontrollable and social -evaluative elements. As it was developed in Trier, it was eventually named the Trier Social Stress Test. It consists of a preparation

period, a free speech and mental arithmetic task in front of an audience (Kirschbaum and Hellhammer, 1989). It has repeatedly shown cortisol responder rates of over 70% (Kudielka *et al.*, 2007).

2.6.2 Cooper's Life Stress Inventory

Cooper's Life Stress Inventory, which is an Occupational Stress Indicator, is an "off-the-shelf" measurement instruments (Cooper *et al.* 1988). It is based on a model of stress incorporating a range of stress sources, individual and organisational effects, and many intervening variables, which include personality factors, perception of control and coping strategies. The questionnaire has 29 items about stress symptoms that Cooper designed in 1983 (Cooper, 1983). Scoring is based on a four-option Likert style (very much, much, a little, never) and each expression is assigned a score 1 to 4. Although the model has been used for many studies, it has been criticized because of the fact that it tries to measure too many aspects at one time (Jones and Bright, 2001).

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2.7 CALORIC INTAKE

Caloric intake is the total number of calories in a daily diet allocation (Stedman's Electronic Medical Dictionary, 2007). Calories are a measure of how much energy food or drink contains. The amount of energy needed will depend on (NHS Choices, 2014):

- i. age – for example, growing children and teenagers may need more energy
- ii. lifestyle – for example, how active you are
- iii. size – your height and weight can affect how quickly you use energy

Other factors can also affect how much energy one burns (NHS Choices, 2014). For example:

- i. some hormones – such as thyroid hormones

- ii. some medications – such as glucocorticoids (a type of steroid used to treat inflammation)
- iii. being unwell

Within a healthy, balanced diet, a man needs around 10,500 kJ (2,500 Kcal) a day to maintain his weight. For a woman, that figure is around 8,400 kJ (2,000 Kcal) a day (NHS Choices, 2014). These values can vary depending on age, metabolism and levels of physical activity, among other things. To maintain a healthy weight, there is the need to balance the amount of calories consumed through food and drink with the amount of calories burnt through physical activity. To lose weight in a healthy way, more energy is needed to be used than consumed.

2.7.1 Caloric Intake and Stress

The habitual choice a person makes in the decision of what to eat can determine an individual's caloric and nutrient intake and hence affect health status. These may be influenced by a myriad of factors including both chronic and acute stress as observed by Halford (2001) and Sherwood (2001). They concluded that hormones released in response to stress could either suppress appetite or induce appetite during recovering from stress.

Stress can have a powerful effect on the appetite and food cravings and hence caloric intake. Stress affects the way the body chooses healthy foods, how these foods are digested and how the nutrients are absorbed (Birmingham, 2006). Poor diet contributes to stress, which, in turn, contributes to a poor diet. For a number of people, food becomes a mechanism for coping with stress.

There are two kinds of stress eaters (Birmingham, 2006):

1. The emotional eater. Emotional eaters turn to food when feeling anxious and have a tendency to overeat at every meal or they may put off eating until dinner, and then they overindulge. This type of eater also turns to food when feeling sad, after a bad day at work, when frustrated or when a relationship turns sour.
2. The restrictive eater. This type of eater restricts their food intake, which increases their stress because they forbid themselves from eating specific foods.

These eaters diet frequently, often cutting out entire food groups and depriving themselves of vital nutrients. Restrictive eaters set themselves up for bingeing, stress-related eating and life-long weight fluctuations.

Continued stress can also increase the cortisol level, stimulating feelings of hunger. Cortisol is responsible for cravings for sugar and high fat foods (Birmingham, 2006). It also contributes to the formation of fat in the midsection, posing a greater risk for cardiovascular disease, increased blood pressure and Type II diabetes.

2.8 DIETARY ASSESSMENT

Dietary assessment is perhaps the best means of obtaining dietary intake information and refers to a review of an individual's usual patterns of food intake and the food selection variables that dictate the food intake.

Dietary intake data may be assessed either by collecting retrospective intake data as with a 24-hour recall or food frequency questionnaire or summarizing prospective intake data, as with a food record kept for a number of days by an individual or the caretaker. Any self-reported method of obtaining data can be challenging because it is difficult for people to remember what they ate, the content, or even an accurate statement of portion size (Thompson *et al.*, 2010).

The choice of data collection depends on the purpose and setting in which the assessment is completed. The goal is to determine the nutrient content of the food and the appropriateness of the intake for a particular individual. The prospective method involves recording data at the time the food is consumed or shortly thereafter (Mahan *et al.*, 2012).

2.8.1 24-Hour Recall

This form of dietary intake assessment is a formal method that a trained person uses to assess the subject through their food intake recall over the previous 24-hours. It is a quick retrospective method of dietary assessment but cannot be used to classify a subject's usual intake as it is not necessarily representative of the subject's normal eating pattern. To overcome these problems the 24-hour was repeated for three days which includes early week, mid-week day and week end day to estimate nutrient intake. This is considered more representative of the usual intake than estimates from a single day (Margretts and Nelson, 1997).

The 24-hour recall method of data collection requires individuals to remember the specific foods and amounts of foods they consumed in the past 24 hours. The information is then analyzed by the person or professional gathering the information.

Problems commonly associated with this method of data collection include (1) an inability to recall accurately the kinds and amounts of food eaten, (2) difficulty in determining whether the day being recalled represents an individual's typical intake, and (3) the tendency for persons to exaggerate low intakes and underreport high intakes of foods. Concurrent use of food frequency and 24-hour recall questionnaires (i.e. doing a cross-check) improves the accuracy of intake estimates (Mahan *et al.*, 2012).

2.8.2 Food Frequency Questionnaire

The food frequency questionnaire is a retrospective review of intake frequency (i.e., food consumed per day, per week, or per month). For ease of evaluation, the food frequency chart organizes foods into groups that have common nutrients. Because the focus of the food frequency questionnaire is the frequency of consumption of food groups rather than of specific nutrients, the information obtained is general, not specific, for certain nutrients (Willett, 1998).

There are a set of options that approximates an individual's usual consumption out of a list of foods. The options are; never eaten, eaten once a month, eaten once a fortnight. The number of times eaten may also be indicated. The intake is estimated with the help of household measures describing portion sizes eaten (Willett, 1998).

The three main types of food frequency questionnaires include; qualitative, semi-quantitative and quantitative. This tool is useful in determining the relationship between the extended consumption of specific groups of food and particular disease risk and or incidence (Mahan *et al.*, 2012). The quantitative food frequency questionnaire was used in this study in order to estimate calorie intake from quantities of food consumed.

CHAPTER THREE

MATERIALS AND METHODS

3.1 STUDY DESIGN

The study was cross sectional.

3.2 STUDY SITES

Data was collected at Tetteh Quarshie Memorial Hospital (TQMH) and Bryan Lowe Orthopedic Hospital (BLOH). The two hospitals are approximately 1 km apart and are located on the Akuapem ridge in Mampong-Akuapem of the Akuapem North Municipality of the Eastern Region, Ghana.

3.2.1 Tetteh Quarshie Memorial Hospital (TQMH)

Tetteh Quarshie Memorial Hospital is a government owned hospital under the Ghana Health Service (GHS). It was built in 1961 and named after the man who brought cocoa to Ghana. He hailed from Akuapem - Mampong. The hospital has total staff strength of 167 of which 85 are nurses. It is the highest referral centre in the district with departments of general medicine, obstetrics and gynaecology, paediatrics, ear nose and throat, optometry, dental, physiotherapy, surgery and mortuary. It runs a 24-hour, seven days a week system and attends to over 200 patients a day.

3.2.2 Bryan Lowe Orthopaedic Hospital (BLOH)

Bryan Lowe Orthopedic Hospital is a private non-governmental hospital located approximately 1 km to the south of TQMH. It was built in 2007 and commissioned in 2008. It employs 49 staff of which 24 are nurses. All though specialised in orthopaedics, it provides services in obstetrics and gynaecology, paediatrics, general medicine, surgery,

physiotherapy and mortuary. The hospital is also a primary care referral centre and runs a 24-hour, seven days a week service with a daily client count of over 150.

3.3 SAMPLE SIZE DETERMINATION

The sample size for proportion was calculated using Cochran's formula (Cochran, 1977):

$$n_o = 384$$

Where: Z = z-score of the confidence level (95%) = 1.96

P = anticipated population proportion = 50% = 0.5

d = margin of error = 5% = 0.05

n_o = minimum sample size without considering the finite population correction (fpc) factor.

Applying the fpc factor, the actual sample size n

$$n = 87.4$$

Where N , the total number of nurses in the two hospitals = 109

3.4 PARTICIPANTS

Participants were nurses in the two hospitals. Nurses who were on full time engagement and locum but run a full shift (40 hours a week normal working time) were recruited for the study. Student nurses on internship and nurses on steroid medications which could affect the level of salivary cortisol were excluded.

3.5 SAMPLING TECHNIQUE

A weighted sampling technique was employed since the two hospitals did not have equal staff strength. The total number of nurses from each hospital was obtained and then the contribution of each hospital to the total sample was calculated by percentage. A convenience random sampling technique was then used to select the number needed from TQMH's staff list. Also, the various ranks of nurses were listed and then respondents were randomly selected from each rank's list to form part of the hospital's quota sample. With BLOH, all of the nurses were included. Based on these, 61 nurses were selected from TQMH and 24 from BLOH. The nurses were ranked into junior, mid-level and senior categories.

3.5 ETHICAL CONSIDERATION

Approval was given by the Ethics and Protocol Review Committee of the School of Biomedical and Allied Health Sciences before the study was conducted. Written permission was sought from the hospitals' administration before recruitment of participants. Before data collection, there was administration of voluntary written and informed consent forms (Appendix I) to participants before recruitment into the study. Subjects were assured of anonymity and confidentiality of any information gathered about them.

3.6 DATA COLLECTION

3.6.1 Questionnaire

A questionnaire was designed and used for data collection. The questionnaire was made up of sections: socio-demographic characteristics, food habits of respondents, data on food intake by 24-hour recall and food frequency questionnaire. .

3.6.1.1 Food Frequency Questionnaire

The quantitative food frequency questionnaire and twenty-four hour recalls were administered to participants to determine their diet histories. The food frequency questionnaire contained a list of selected foods. These selected foods were classified in to groups that provide similar nutrients (example cereals and grains, fruits, fruit juices, soft drinks, animal protein, plant protein among others). Participants ticked how frequent they ate those foods. Options included were daily, weekly, occasionally or never (see section C of Appendix II).

3.6.1.2 24-hour Recall

The twenty-four hour recall was used to determine the foods and fluids consumed by participants in the last 24-hours (Asare-Annan, 2011). Questions regarding time, quantity, form (fried, boiled, roasted) and type of meal (breakfast, lunch, supper, snack) of foods eaten were asked. Questions were asked about the kind of meal taken (breakfast, lunch or supper), the time the meal was eaten (8:00am, 12:00pm, 4:00pm etc.), and the food eaten (example banku with okro soup). Household handy measures common to the Ghanaian were then used to estimate portion sizes consumed (example one heaped tablespoon full) during meal times (Appendix II) (Asare-Annan, 2011).

3.6.1.3 Cooper's Life Stress Inventory

After the FFQ and 24-hour recall assessments, Cooper's life stress inventory (Section D of Appendix II) was then given to participants to tick their perceived severity of stressors listed.

The Cooper's life stress inventory contains a list of stressors known to be experienced in the life of people. It was pretested in the study setting to take out some stressors that did

not apply to the study population. A few stressors that applied to the population but was not included in the original list were also added. Each stressor was assigned a Likert scale score against which study participants tick. Their total scores were calculated and grouped according to their levels of stress. A total score of zero (0) to twenty-five (25) was classified as no stress, twenty-six (26) to fifty-two (52) was classified as moderate stress and fifty-three (53) to seventy-eight (78) was classified as very high stress.

3.6.2 Anthropometric Measurements

3.6.2.1 Height, weight and body mass index (BMI) determination

The anthropometric measurements were taken from 9:00 am in the morning to about 12:00 noon. It was first explained to the respondents the various measurements to be taken and what would be required of them. The height was taken first followed by weight and other anthropometries such as total body fat, visceral fat and BMI.

Height was measured using a portable stadiometer (Seca, Hamburg, Germany) which was placed on a firm flat ground to ensure accuracy. Height was recorded to the nearest 0.1cm. Participants' weight was measured to the nearest 0.1cm using a Seca 770 floor digital scale (Seca, Hamburg, Germany). Respondents were in minimal clothing, and were asked to remove shoes, jackets and other heavy objects before standing on the scale. They stood on the scale with feet fully placed on the scale to ensure that weight was evenly distributed on both feet.

Body Mass Index was determined from the height and weight measurements and calculated as W/H^2 . A simple range of values defined as underweight < 18.5 (kg/m^2), normal weight $18.5\text{-}24.5$ (kg/m^2), overweight $25\text{-}29.9$ (kg/m^2), obese ≥ 30 (kg/m^2) was used in this study based on the World Health Organisation criteria for adults (WHO, 2010).

3.6.3 Measurement of Cortisol

3.6.3.1 Saliva Collection

About 5 ml of saliva samples were taken with a clean test tube. Participants were asked to rinse their mouths and then wait for 10 minutes. Pooled saliva was then taken into the test tube and corked with a cotton bud. All samples were taken at least 45 minutes after food had been consumed (Kudielka *et al.*, 2009) to ensure that food eaten did not affect salivary cortisol levels. The test tube with saliva was then transported to the laboratory. From these samples, twenty-five microliters (25 μ l) was measured and used for the cortisol analysis (Salimetrics, 2014).

3.6.3.2 Salivary Cortisol Enzyme Immunoassay Steps

A clean, disposable tip was used for dispensing each standard and each patient sample. Twenty-five microliters each of the standards and samples were pipetted into their respective wells. These were followed by the addition of 200 μ l diluted Cortisol-HRP conjugate to each well; well A1 was left for substrate blank. The wells were covered with the foil supplied in the kit and incubated at 37°C for 1 hour. When the incubation was completed, the foil was removed and contents of the wells were aspirated.

The wells were next washed thrice with three hundred microliters (300 μ l) of diluted wash solution. Overflows from the reaction wells were avoided. During each washing step, the plate was gently shaken for 5 seconds and excess solution was removed by tapping the inverted plate on an absorbent paper towel.

Hundred microliters (100 μ l) TMB solution was dispensed into wells and incubated for exactly fifteen minutes (15min) at room temperature (22 - 28°C) in the dark. Then 100 μ l of the stop solution was dispensed into all wells in the same order as the TMB substrate

solution and the microplate was gently shaken. The absorbance of the specimen at 450 nm against a reference wavelength of 620-630 nm was measured (Salimetrics, 2014)

3.7 DATA ANALYSIS

Descriptive analysis was used to analyse the variables, cortisol levels, dietary patterns and stress levels with the help of Statistical Package for Social Scientists Version 21 (SPSS 21.0). Data gathered with 24-hour recalls and food frequency were analysed to determine if types and quantity of food eaten during the on-duty hours differed from those of the off-duty using Micro-Diet version 5. The levels of cortisol during duty hours and off duty hours were then correlated to caloric intake based on the premise that cortisol affects appetite positively in chronic stress and that normal level of cortisol follows a circadian clock in normal hours only.

Psychological levels of stress was compared to both physiological measures and caloric content of foods consumed with Spearman's correlation test. A 'p' value less than 0.05 was considered statistically significant. Variations in stress levels among various ranks of nurses was analysed with frequency tables.

CHAPTER FOUR

RESULTS

4.1 SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE NURSES

Table 1 shows the socio-demographic characteristics of the nurses. A total of 85 nurses were recruited. Majority (90.60%) of the nurses were females. More than half (68.20%) of them were married. The nurses were predominantly Christians (92.9%). In terms of educational status, more than half (56.5%) had a diploma/certificate in their profession. The mean age of the nurses was 34.86 ± 6.27 years and majority (61.2%) of them were in the 25 – 34 years age group.

Table 1: Socio-demographic characteristics of the nurses

VARIABLE	CATEGORY	NUMBER	PERCENTAGE
Gender	Male	8	9.4
	Female	77	90.6
Age (years)	25 - 34	52	61.2
	35- 44	28	32.9
	45 - 55	5	5.9
Marital status	Married	58	68.2
	Single	27	31.8
Religion	Christianity	79	92.9
	Islam	6	7.1
Education	Diploma	48	56.5
	Degree	37	43.5

4.2 ANTHROPOMETRIC MEASUREMENTS OF THE NURSES

Table 2 shows the anthropometric measurements of the nurses. Their mean height was $1.59 \pm .07\text{m}$ and their mean weight was $65.80 \pm 6.80\text{ kg}$. Their BMI ranged from $17.96 - 34.82\text{ kg/m}^2$ with a mean of $26.11 \pm 2.96\text{ kg/m}^2$. Majority of the nurses (52.9%) were in the WHO classification of overweight (Figure 1).

4.3 FREQUENCY OF CONSUMPTION OF FOODS

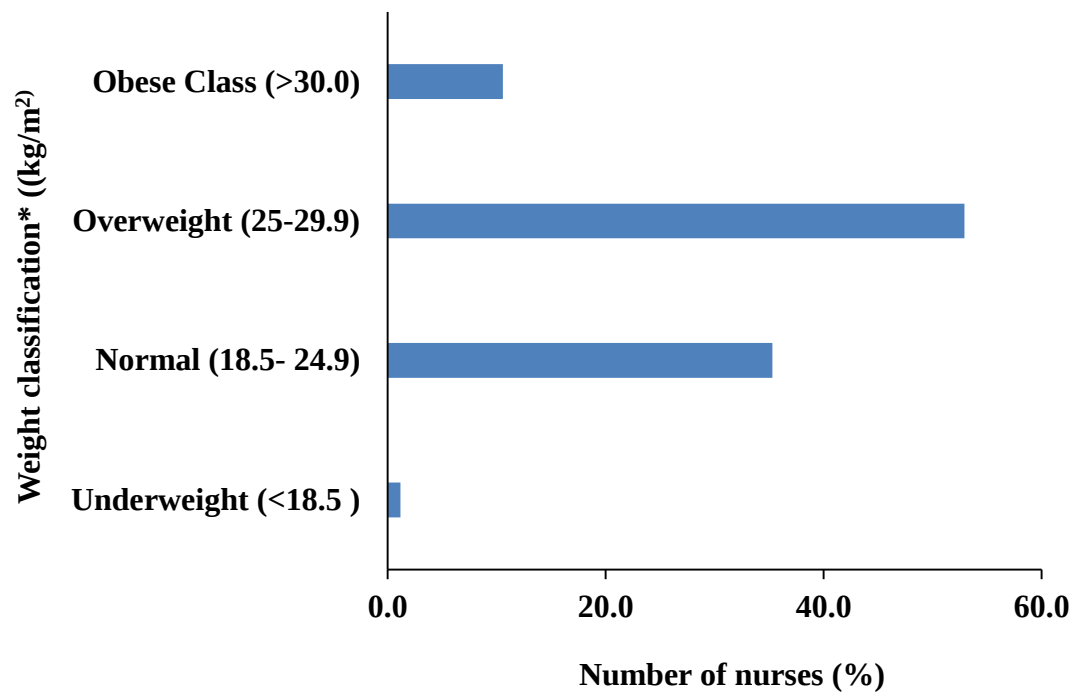
Figure 2 shows the frequency of consumption of the different food groups by the nurses. Animal protein was consumed more frequently than all other food groups with 89.4% of the nurses consuming it daily. This was followed by a daily consumptions of cereals and grains (71.8%). The least frequent daily consumed of the food groups by the nurses was fruit juice (7.1%). In terms of weekly consumption, soft drinks were the most consumed (32%).

4.4 ON DUTY AND OFF DUTY DAILY CALORIC INTAKE OF THE NURSES

The mean daily caloric intake of the nurses, both on duty and off duty, is shown in Figure 3. The nurses had higher intakes of calories when off duty compared to when on duty. There was a statistically significant difference ($p < 0.0001$) in caloric intake between on duty and the off duty hours of the nurses.

Table 2: Anthropometric measurements of the nurses

VARIABLE	MINIMUM	MAXIMUM	MEAN	STD. DEVIATION
Height (m)	1.42	1.75	1.59	0.07
Weight (kg)	51.90	80.70	65.80	6.80
BMI (kg/m²)	17.96	34.82	26.11	2.96

**Figure 1:** Weight classification of the nurses based on BMI

*WHO 2010.

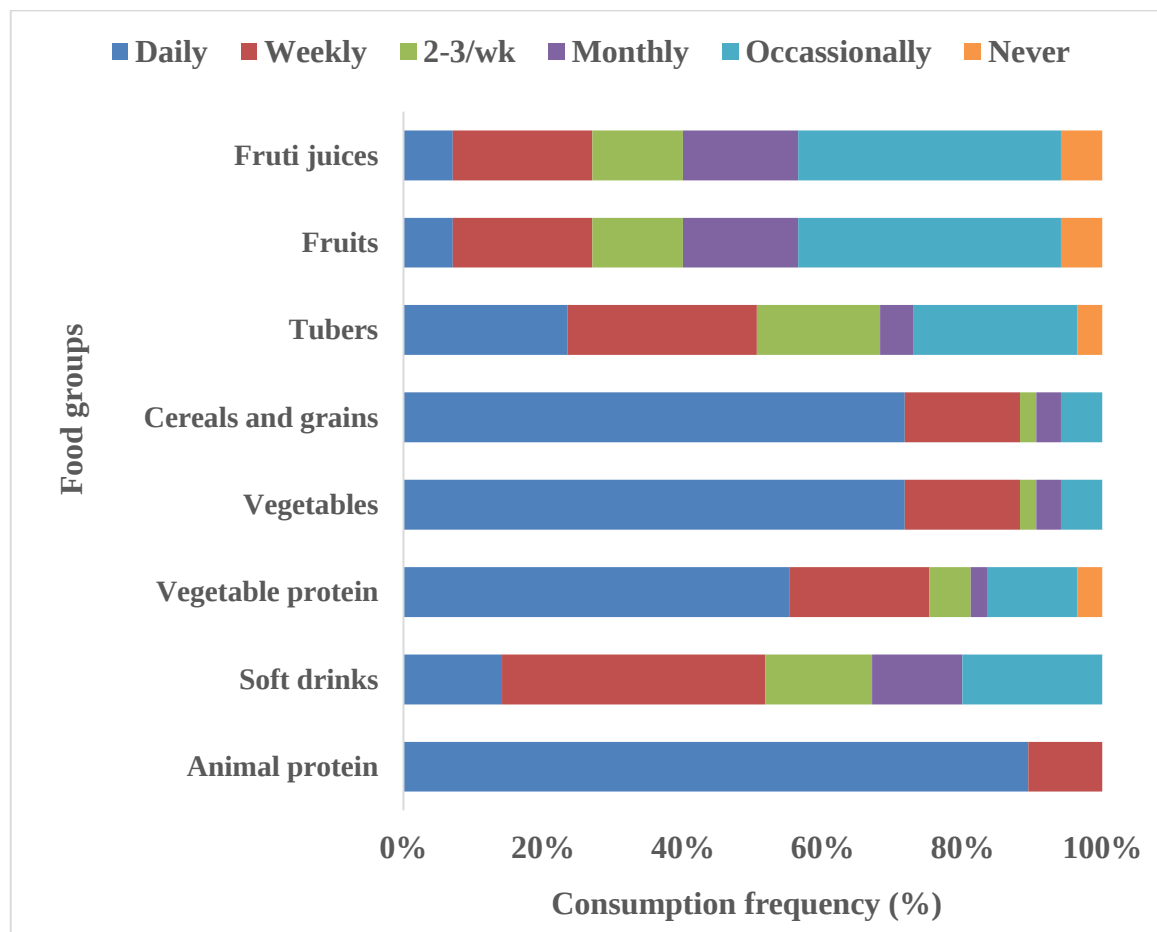


Figure 2: Frequency of consumption of foods.

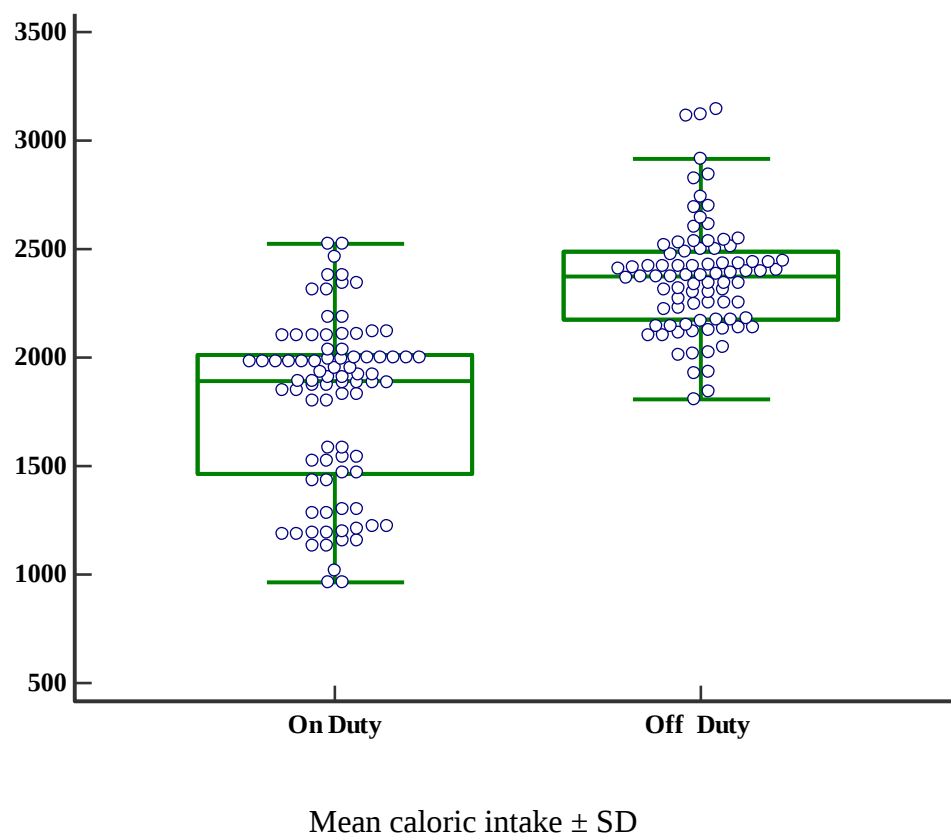


Figure 3: On duty and off duty daily caloric intake of the nurses,

4.5 ON DUTY AND OFF DUTY STRESS LEVELS OF THE NURSES

4.5.1 Psychological Stress Scores

The psychological scores of the nurses, both on duty and off duty, is shown in Figure 4.

The nurses had lower psychological stress scores when off duty compared to when on duty.

There was a statistically significant difference ($p < 0.0001$) in psychological stress scores between on duty and the off duty hours of the nurses.

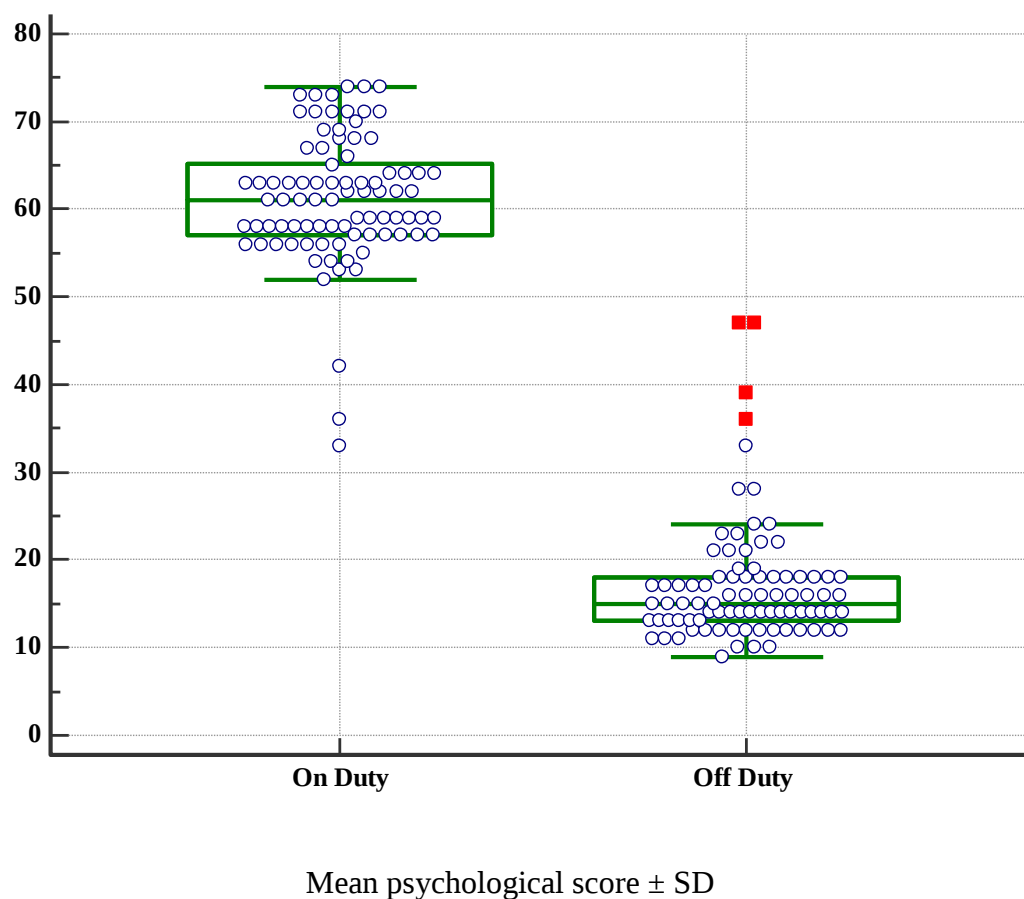


Figure 4: On duty and off duty psychological scores of the nurses.

4.5.2 Salivary Cortisol Levels

The salivary cortisol levels of the nurses, both on duty and off duty, are shown in Figure 5. The nurses had higher salivary cortisol levels when on duty compared to when off duty. There was a statistically significant difference ($p < 0.0001$) in salivary cortisol levels between on duty and the off duty hours of the nurses.

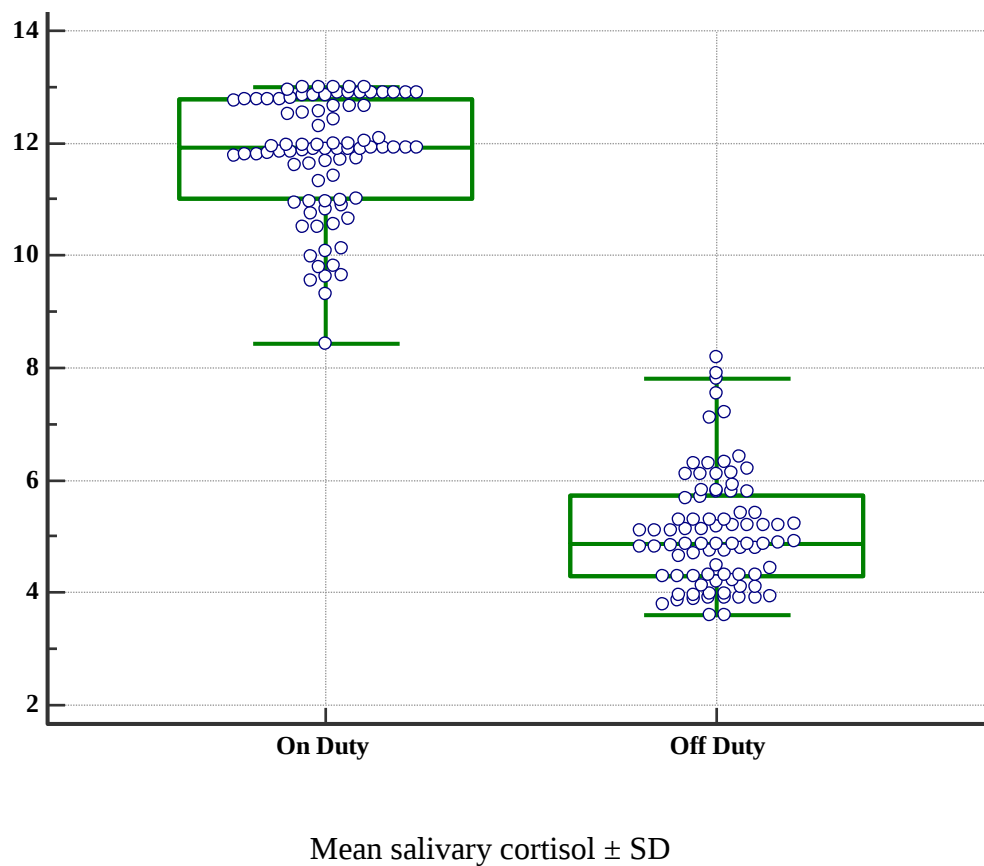


Figure 5: On duty and off duty salivary cortisol levels of the nurses

4.6 EFFECTS OF STRESS ON TOTAL DAILY CALORIC INTAKE OF NURSES

4.6.1 Psychological Levels of Stress

Low mean psychological stress level scores (17.12 ± 7.15) corresponded to high mean total daily caloric intake (2368.74 ± 259.67 kcal) while the nurses were off-duty. On the other hand, high mean psychological stress level scores (61.18 ± 7.42) corresponded to low mean total daily caloric intake (1784.80 ± 402.84 kcal) while the nurses were on-duty. However, no significant correlations (all P s >0.05) were observed.

4.6.2 Salivary Cortisol Levels

Low mean salivary cortisol levels (5.10 ± 1.02 $\mu\text{g}/\mu\text{l}$) corresponded to high mean total daily caloric intake (2368.74 ± 259.67 kcal) while the nurses were off-duty. On the other hand, high mean salivary cortisol levels (61.18 ± 7.42 $\mu\text{g}/\mu\text{l}$) corresponded to low mean total daily caloric intake (1784.80 ± 402.84 kcal) while the nurses were on-duty. However, significantly positive correlations (Figs. 6 and 7) were observed with total caloric intakes and salivary cortisol levels whether the nurses were on duty ($R = 0.5850$, 95% confidence interval 0.4248 to 0.7096, $P < 0.0001$) or off duty ($R = 0.3185$, 95% confidence interval 0.1130 to 0.4978, $P < 0.003$).

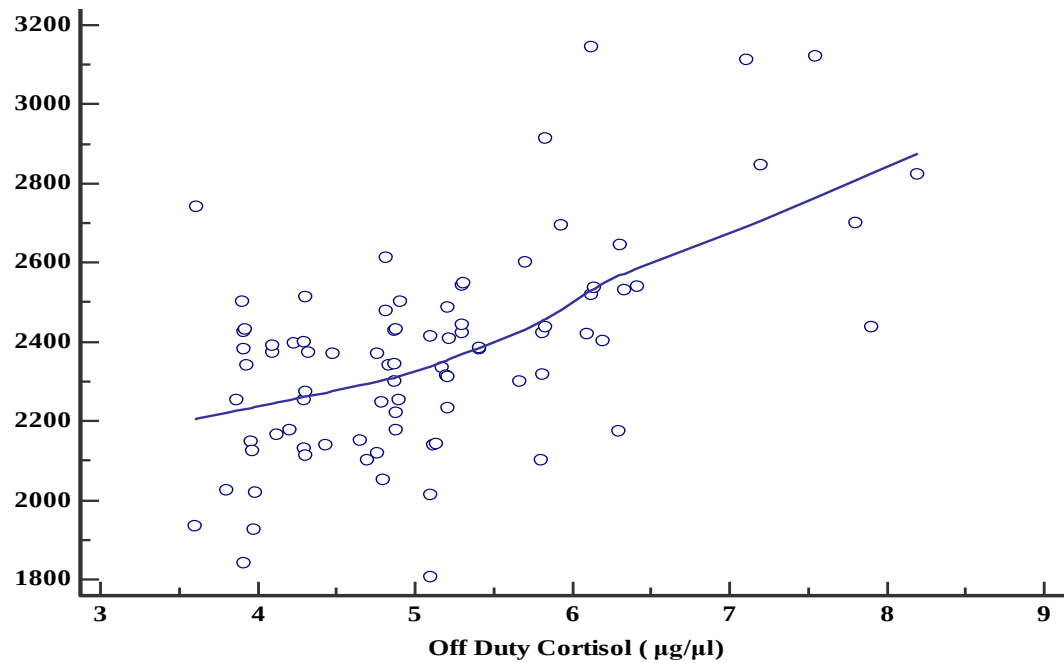


Figure 6: Correlation between off duty total caloric intakes and off duty salivary cortisol levels of the nurses.

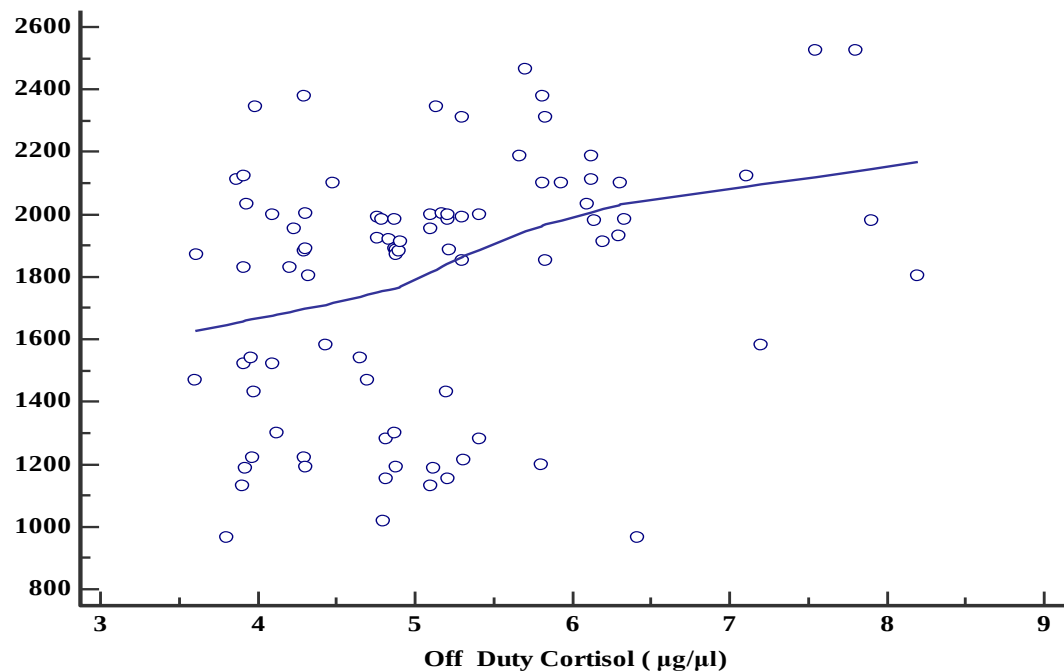


Figure 7: Correlation between on duty total caloric intakes and off duty salivary cortisol levels of the nurses.

4.7 RANKS OF NURSES AND THEIR PSYCHOLOGICAL LEVELS OF STRESS

Almost all the nurses (91.2%), irrespective of rank indicated that they had no stress while off duty. Almost all the nurses (95.3%), irrespective of rank, also indicated that they had very high stress on duty (Fig. 8). Mid-level and junior nurses recorded the highest frequency (n=30 each rank) of very high stress scores while on duty as well as highest numbers of no stress when off-duty. Fewer senior nurses (n=18) recorded high psychological stress levels while on-duty.

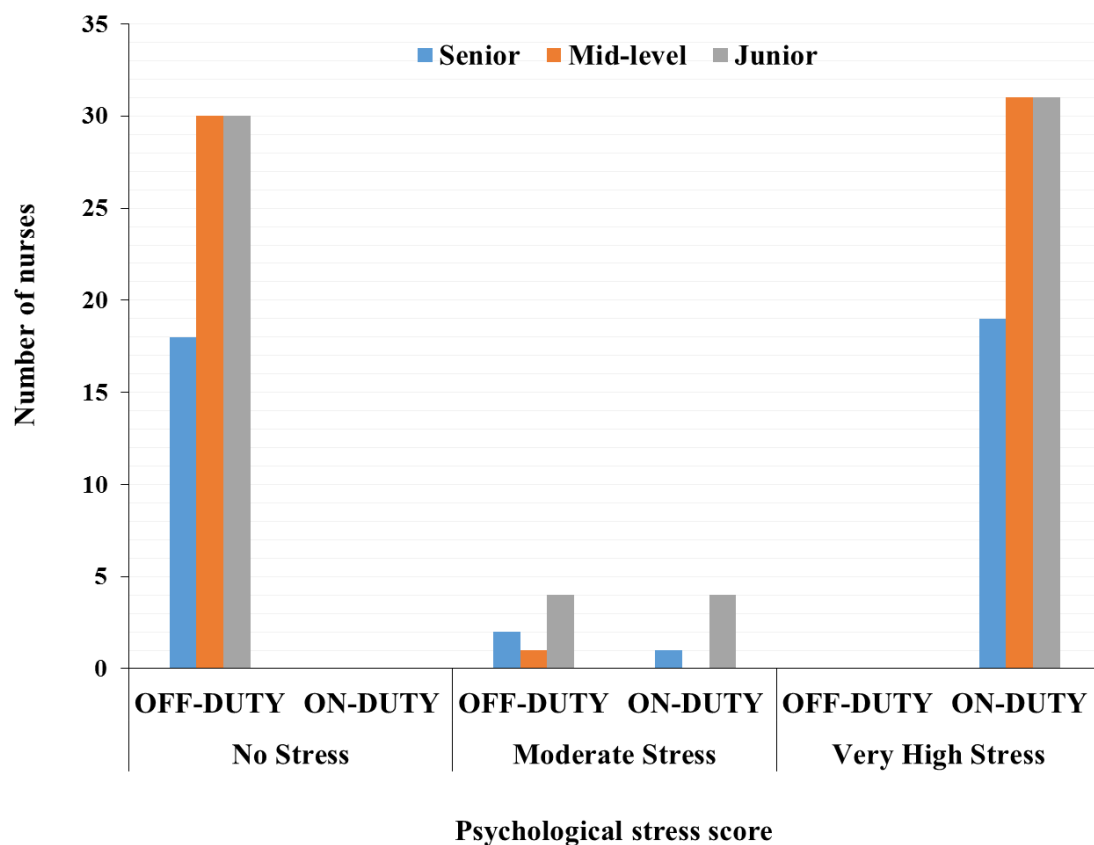


Figure 8: Ranks of nurses and their psychological levels of stress

CHAPTER FIVE

DISCUSSION AND CONCLUSIONS

5.1 DISCUSSION

A stable and productive health service is of vital importance to any country. This includes the nursing profession which comprises by far the greatest component of this service section. The nursing profession is seen as a stressful and demanding profession (Carson *et al.*, 1991). Stress affects the diet and eating pattern of people. This study assessed the association between caloric intake and work related stress among nurses in two district level hospitals (Tetteh Quarshie Memorial Hospital and Bryan Lowe Orthopedic Hospital) in Mampong-Akuapem of the Akuapem North Municipal Assembly of the Eastern Region, Ghana.

Anthropometric measures are useful to interpret the nutritional status of people (Mahan *et al.*, 2012). The mean BMI of the nurses was $26.11\text{kg/m}^2 \pm 2.96$. This is slightly above the upper range of normal range of BMI which is 18.5kg/m^2 to 24.9kg/m^2 (Mahan *et al.*, 2012). This suggests that the majority of the nurses were overweight. Overweight could lead to obesity (Mahan *et al.*, 2012) and its related health problems if unchecked. This BMI status of the nurses could be due to their high consumption of simple carbohydrates such as soft drinks as shown in their dietary pattern assessment. This agrees with findings that individuals may seek out and consume energy dense foods during stressful situations (Schiffman 2000, Oliver 2000). Another contributory factor to high BMI of nurses could be their relative inactivity for long hours when they had few patients to attend to or when they dispensed medications and were waiting in the wards (Onasoga & Osamudiamen, 2013). When nurses closed from work, they engaged in little exercises and tended to rest till their next shift begun.

These prolonged hours of physical inactivity means that even though their energy intake may be low, they did not utilize all of the energy and their bodies still managed to store some energy as fat thereby increasing BMI.

Food intake assessment revealed that animal source proteins were more frequently consumed, (>80%) daily than any other food group. Cereals and grains were the next (71%) frequently consumed food group. This was due to their choices of foods like banku, rice, kenkey and waakye which are cereal and grain based and constitute the staples in that area. These foods are mostly whole grain and can contribute a good source of dietary fibre. These starch based foods are also a good source of energy and will add to energy gotten from the consumption of simple carbohydrate foods such as soft drinks.

The 24-recalls revealed that nurses skipped meals usually whiles on duty. This made mean calories consumed (1,754.85kcal) on-duty less than the adult energy RDI (1800kcal to 2200kcal). This was reflected in the BMI of some respondents being as low as 17.96kg/m² which classifies such individuals as underweight. Nurses explained that working morning shifts which will start at 7:00am and end at 2:00pm meant they had to wake up early and go to work. They had to get breakfast en route to work and will usually take their breakfast around 11:00am. Hence during lunch hour, they felt full and will wait till they got home to eat supper around 4:30 to 5:00 pm. Hence such routines had made them used to skipping lunch as this was convenient for them.

The 24-hour recall dietary assessment revealed that whiles on duty, some nurses could consume as low as 966 kcal/day. This low energy intake could have significant impact on immune response and considering that their risks of infection are greater.

This will agree with ILO, 1986 findings that these interactions could prove hazardous on health of workers. Such low intake of calories also agrees with Wardle and Gibson findings in 2002 that acute stress for example that to personal safety such as experienced by nurses when emergency patients are rushed into the hospital results in a physiological response that suppresses appetite (Wardle-Gibson, 2002). This also led Bhatia, 2005 to conclude that the raised levels of stress and depression among nurses in carrying out their duties could affect body systems that relate to nutritional status of these individuals (Bhatia, 2005).

High scores in psychological and physiological stress indices in accordance with Lambert and Lambert (2001) who concluded after a review of healthcare settings across seventeen (17) countries that nurses experience a high level of occupational stress, related to low caloric intake. This finding confirms Halford (2001) conclusions that hormones released in response to stress could either suppress appetite or induce appetite. In this instance, increased salivary cortisol levels related to decreased energy intake ($p=0.0001$) and may suggest that increased salivary cortisol levels could decrease appetite. Sherwood (2001) and Mehlum (1999) reported a suppression of appetite by corticotropin-releasing hormone (CRH) during stress. Bjorntorp, 2001, agrees that cortisol as a marker of HPA axis activity, may affect the regulation of appetite via neuropeptide Y and leptin. However, he argues that increases in cortisol seem to be followed by elevated secretion of neuropeptide Y and blunting of the inhibitory arm of food intake called the leptin system an overall effect may be an increase in food intake.

Mean salivary cortisol level measured both on duty ($11.75\mu\text{g}\pm 1.06$) and off-duty ($5.09\mu\text{g}\pm 1.02$) showed that salivary cortisol as an indicator of physiological stress will rise with rising stress levels. Cortisol levels rise due to perturbations in the organism's environment (i.e., stressors) (Kalman & Grahn, 2004).

Hyper-activation of the HPA axis, with release of corticosteroids (cortisol) has been associated with individuals who are chronically stressed (Bjortorp, 2000). These elevated levels of the hormones are necessary to mobilise energy from body stores in order to deal with the stress encountered. Responses to acute or chronic stress can lead to physiological changes which include elevation of blood pressure, increase in heart rate, mobilisation of energy stores, and decrease in blood flow to non-essential organs, for example the digestive system, kidneys and skin (Cohen, 2000). This implies that blood and energy are shunted to the areas of the body such as muscles, cardiovascular system and the liver that will utilize it to contain or overcome the stress placed upon the body.

A correlation of on-duty psychological stress scores and on-duty caloric intake was weak (0.07) and statistically insignificant ($p=0.535$). This implies that even though high scores of psychological were registered, there was very little effect on caloric intake. This is observed because during work hours, there is reduced access to food in the hospital premises. In addition, nurses may be so busy attending to patients that they forget to eat or will not be able to make the time to acquire food. The same correlation off-duty showed an inverse relationship (-0.082 , $p=0.457$). This observation means that as psychological stress is reducing as nurses are in their various homes, caloric intake rather increases. This also agrees with Takeda, 2004 who said that cortisol is known to stimulate appetite during recovery from stress (Takeda *et al.*, 2004). Relatively elevated cortisol levels while nurses were off duty correlated with increased caloric intake ($p<0.001$).

A correlation ($p=0.003$) of off duty cortisol level and on duty caloric intake further confirmed that when cortisol levels increase food intake by nurses also increased. This further confirmed Takeda's (2004) findings that increased cortisol levels will increase appetite and hence food intake.

The nurses when they return home from work are able to better consume foods as this is the time they are relaxing and far removed from stress. Also, when nurses are in their various homes, they have time to prepare foods to eat. The lack of time to prepare and consume foods whiles under stress as observed in nurses has also been used to explain higher energy intake in stressed individuals by Prentice and Jebb (2003). They observed that energy intake is higher during periods of life stress due to insufficient time to purchase and prepare foods and the increased use of convenience foods, which are typically energy dense.

Perceived stress of the various nursing ranks was also assessed both off and on duty. Little numbers reported high stress whiles off-duty with the only indication being moderate stress among some senior rank nurses. Whiles at work however, all recorded very high stress with the highest scores being mid-level and junior ranked nurses. This suggests higher exposure to stressors among junior ranks in accordance with Onasoga & Osamudiamen, 2013 who observed significant relationship between the rank of nurses and of the emotional type of stress experienced. This finding however disagrees with Atindanbilla *et al.* (2012) who said that the rank of a nurse does not affect his or her emotional state as their results indicated no significant difference between staff nurses (SN) and the senior staff nurses (SSN) with regards to the work related emotional states of depression, anxiety and stress.

The limitation of the study were:

1. One of the hospital went through redundancy during data collection and this could influence responses for stress score. It also accounted for the non-responses.
2. Since the research was self-funded, sample size was limited to be able to make efficient use of the available resources.
3. Some foods were not found on the Micro-diet software used in analysis hence were replaced by similar foods. This could have led to incorrect estimation of caloric intake.
4. Under-reporting or over-reporting of consumed foods by the nurses could also have occurred.

5.2 CONCLUSIONS

The nurses showed significant differences (all P s <0.001) in their stress levels, when on duty and when off duty. Their psychological stress scores and salivary cortisol levels (physiological stress) were high when they were on duty and this correlated with low intake of calories. The nurses psychological and physiological stress scores were however low when they were off duty and these correlated with high caloric intake. Low caloric intake when nurses were on duty suggested that duty hours limited food intake considerably while the opposite was true when nurses were off-duty. Stress levels differed among the various ranks of nurses with staff nurses scoring the highest number of reported high stress.

It is recommended that

1. Hospitals should be encouraged to operate hospital canteen purposefully to serve staff and clients at all hours of the day.
2. Nurses experiencing high stress should be given stress management counseling sessions to manage their stress since such high chronic stress could be hazardous to their own health.

REFERENCES

- Abbas S, Farah A & Apkinar-Sposito C (2013). Measuring the Immeasurable! An Overview of Stress & Strain Measuring Instruments. *MJSS* **4**(10): 480.
- Asare-Annan J (2011). Obesity and its determinants among Junior High School children in the Accra metropolis. MSc. Thesis. University of Ghana, Legon.
- Ashman SB, Dawson G, Panagiotides H, Yamada E & Wildinon CW (2002). Stress hormone levels of children of depressed mothers. *Dev Psychopathol* **14**:333–349.
- Atindanbila S, Abasimi E & Anim MT. (2012). A study of work related depression, anxiety and stress of nurses at Pantang Hospital in Ghana. *Int J Human Soc Sci Res* **2**(9): 1–9.
- Bailey JT, Steffen SM & Grout JW (1980). The stress audit: Identifying the stressors of ICU nursing. *J Nursg Educ* **19**: 15-25.
- Bhatia V & Tandon RK (2005). Stress and the gastrointestinal tract. *J Gastroenterol Hepatol* **20**:332-339.
- Birmingham K (2006). *Eating Disorders*. Eating Disorders Venture, LLC. Available online at <http://www.eatingdisordershelpguide.com/>
- Birnbach, N. (1999). Commentary: Registration. In T. Schorr & M. Kennedy (Eds.) 100 years of American nursing: Celebrating a century of caring (pp. 17–22). Philadelphia: Lippincott.
- Bjorntorp P, Holm G, Rosmond R & Folkow B (2000). Hypertension and the metabolic syndrome: closely related central origin? *Blood Press* **9**:71-82.
- Bjorntorp P & Rosmond R (2000). Obesity and cortisol. *Nutrition* **16**:924-936.
- Caplan RD, Cobb S, French JRP, Harrison RV & Pinneau SR (1980). Job demands and worker health: Main effects and occupational differences. Ann Arbor: Institute for Social Research. (Originally published as HEW Publication No. (NIOSH) 75-106,
- Carnegie M (1995). *Path we tread: Blacks in nursing worldwide*. New York: Jones and Bartlett. pp. 1854–1994

- Carson J, Bartlett H & Croucher P (1991). Stress in community psychiatric nursing: a preliminary investigation. *Community Psychiatric Nurs J* **11**: 8–12.
- Charmandari E, Tsigos C & Chrousos G (2005). Endocrinology of the stress response. *Annu Rev Physiol* **67**:259-284.
- Cochran WG (1977). *Sampling Techniques*. 3rd Ed. New York: John Wiley & Sons
- Cohen JJ (2000). Stress and mental health: a biobehavioral perspective. *Issues Ment Health Nurs* **21**:185-202.
- Coleman CA, Friedman AG & Burright RG (1998). The relationship of daily stress and health-related behaviors to adolescents' cholesterol levels. *Adolescence* **33**: 447–460.
- Conway TL, Vickers RR, Ward HW & Rahe RH (1981). Occupational stress and variation in cigarette, coffee, alcohol consumption. *J Health Soc Behav* **22**:155-165.
- Cooper CL, Sloan SJ & Williams S (1988). Occupational stress indicator. Windsor: Nfer-Nelson
- Cooper CL (1981). *The Stress Check-Coping with the Stresses of Life and Work*. Englewood Cliffs, N.J: Prentice-Hall.
- Cox T, Griffiths A & Cox S (1996). *Work-related Stress in Nursing: Controlling the Risk to Health*. International Labour office, Geneva, Switzerland
- Cox T & Griffiths A (1996). The Nature and Measurement of Work Related Stress: Theory and Practice. Corlett and J.Wilson (eds.): Evaluation of Human Work: A Practical Ergonomics Methodology (London, Taylor and Francis, 1996).
- Dewe PJ (1987). New Zealand ministers of religion: Identifying sources of stress and coping strategies. *Work & Stress* **1**(4):351-363.
- Dickerson SS & Kemeny ME (2002). Acute stressors and cortisol responses: a theoretical integration and synthesis of laboratory research. *Psychol Bull* **130**(3):355–391.
- Dossey B (2009) *Florence Nightingale: Mystic, Visionary, Healer*. Philadelphia: F.A. Davis.

Essex MJ, Klein MH, Cho E & Kalin NH (2002). Maternal stress beginning in infancy may sensitize children to later stress exposure: effects on cortisol and behavior. *Biol Psychiatry* **52**:776–84.

European Agency for Safety and Health at Work (2002). Factsheet 22 - Work-related stress. Available at <https://osha.europa.eu/en/tools-and-publications/publications/factsheets/22/view>.

Genwaybio.com (10/03/2015). Cortisol Saliva. Available at <http://www.genwaybio.com/cortisol-saliva>

Gibson EL (2006). Emotional influences on food choice: sensory, physiological and psychological pathways. *Physiol Behav* **89**:53–61.

Goodyer IM, Herbert J, Altham PM, Pearson J, Secher SM & Shiers HM (1996). Adrenal secretion during major depression in 8- to 16-year-olds: I. Altered diurnal rhythms in salivary cortisol and dehydroepiandrosterone (DHEA) at presentation. *Psychol Med* **26** (2):245–56.

Gray-Toft P, & Anderson TG (1981). The nursing stress scale: development of an instrument. *J Behav Assess* **3**:11-23.

Greeno CG & Wing RR (1994). Stress-induced eating. *Psychological Bulletin* **115**: 444–464.

Gunnar MR & Donzella B (2002). Social regulation of the cortisol levels in early human development. *Psychoneuroendocrinology* **27**(1–2):199–220.

Gutteling BM, de Weerth C & Buitelaar JK (2005). Prenatal stress and children's cortisol reaction to the first day of school. *Psychoneuroendocrinology* **30**:541–9.

Habhab S, Sheldon JP & Loeb RC (2008). The relationship between stress, dietary restraint, and food preferences in women, *Appetite* **52**:437–444

Halford JC (2001). Pharmacology of appetite suppression: implication for the treatment of obesity. *Curr Drug Targets* **2**:353-70.

Hellerstedt WL & Jeffery RW (1997). The association of job strain and health behaviours in men and women. *Int J Epidemiol* **26**(3): 575-583.

- Henderson V (1964). The nature of nursing. *Am J Nurs* **64**(8): 62-68.
- Hingley P (1984). The humane face of nursing. *Nurs Mirror* **159**: 19-22.
- Hingley P & Cooper CL (1986). *Stress and the Nurse Manager*. Chichester, John Wiley.
- House JS (1981). Work stress and social support. Reading, MA, Addison-Wesley.
- Huber D (1995). Understanding the sources of stress for nurses. *Aust J Nurs* **12**: 87–100.
- Huizink AC, Robles de Medina PG, Mulder EJ, Visser GH & Buitelaar JK (2003). Stress during pregnancy is associated with developmental outcome in infancy. *J Child Psychol Psychiatry* **44**: 810–818.
- ILO (1984). *Psychosocial factors at work: Recognition and control*. Occupational Safety and Health Series No. 56. Report of the Joint ILO/WHO Committee, on Occupational Health Ninth Session. Geneva, 18-24 September 1984
- Ivancevich JM & Smith SV (1981). Identification and analysis of job difficulty dimensions: An empirical study. *Ergonomics* **24**: 351-364.
- James J (2001). Isabel Hampton and the professionalization of nursing in the 1980s. In E. Baer, P. D’Antonio, S. Rinker, and J. Lynaugh (Eds.), *Enduring issues in American nursing* New York: Springer (42-84).
- Jones FI & Bright J (2001). *Stress: Myth, theory and Research*. Harlow, UK: Prentice Hall.
- Ohman L, Bergdahl J & Nyberg L (2007). Longitudinal analysis of the relation between moderate long-term stress and health. *Stress & Health* **23**(2): 131–138.
- Kahn RL, Wolfe DM., Quinn RP, Snoek JD & Rosenthal RA (1964). *Organizational Stress: Studies in Role Conflict and Ambiguity*. New York: Wiley.
- Kalman B & Grahn RE (2004). Measuring salivary cortisol in the behavioral neuroscience laboratory. *J Undergrad Neurosci Educ.* (2):A41-49
- Kammerer M, Adams D & von Castelberg B (2002). Pregnant women become insensitive to cold stress. *BMC Pregnancy Childbirth* **2**:8.
- Karasek RA (1979). Job demands, job decision latitude and mental strain: Implications for job redesign. *Admin Sci Quart* **24**: 285-308.

- Kellyn M (1989). The Omnibus Budget Reconciliation Act of 1987. A policy analysis. *Nursing Clinics of North America*, **24**(3): 791–794.
- Kirschbaum C & Hellhammer DH (1994). Salivary cortisol in psychoneuroendocrine research: recent developments and applications. *Psychoneuroendocrinology* **19**:313–333.
- Kirschbaum C & Hellhammer DH (2000). Salivary cortisol. In: Fink, G. (Ed.), *Encyclopedia of Stress*. Academic Press, San Diego. pp 379-383
- Kirschbaum C & Hellhammer DH (1989). Salivary cortisol in psychobiological research: an overview. *Neuropsychobiology* **22**: 150-169.
- Kirschbaum C, Pirke KM & Hellhammer DH (1993). The ‘Trier Social Stress Test’—a tool for investigating psychobiological stress responses in a laboratory setting. *Neuropsychobiology* **28**: 76-8.
- Kudielka BM, Hellhammer DH & Wüst S (2009). Why do we respond so differently? Reviewing determinants of human salivary cortisol responses to challenge. *Psychoneuroendocrinology* **34**(1):2-18
- Kudielka BM, Hellhammer DH & Kirschbaum C (2007). Ten years of research with the Trier Social Stress Test (TSST) revisited. In: Harmon-Jones, E., Winkielman, P. (Eds.), *Social Neuroscience: Integrating Biological and Psychological Explanations of Social Behavior*. The Guilford Press, New York (Chapter 54) pp. 56-83.
- Lambert VA & Lambert CE (2001). Literature review of role stress/strain on nurses: an international perspective. *Nurs Health Sci* **3** (3): 161–172.
- Landsbergis PA, Schnall PL, Deitz DK, Warren K, Pickering TG & Schwartz JE (1998). Job strain and health behaviors: Results of a prospective study. *Am J Health Promo* **12**(4): 237-245.
- Leatt P & Schneck R (1980). Differences in stress perceived by head nurses across nursing specialities in hospitals. *J Adv Nurs* **5**: 31-46
- Levi L (1981). *Preventing work stress*. Reading, Mass., Addison-Wesley.

- Lynaugh J (2001). Nursing's history: Looking backward and seeing forward. In E. Baer, P. D'Antonio, S. Rinker and J. Lynaugh (Eds.) *Enduring Issues in American Nursing* (pp. 10–24). New York: Springer.
- Macht M (2008). How emotions affect eating: a five-way model. *Appetite* **50**(1): 1–11.
- Mahan KL, Escott-Stump S and Raymond (2012). *Food and the Nutrition Care Process*. 13th Edition, USA, Frazier Publishing Services. pp.137-140.
- Margretts BM and Nelson M (1997). Design concepts in nutritional epidemiology, 2nd edition, Oxford University Press. pp. 123-143
- Mason DJ (2011). The Nursing Profession: Development, Challenges, and Opportunities. In: *The Nursing Profession: Development, Challenges, and Opportunities*, 1st edition (Diana J. Mason, Stephen L. Isaacs, David C. Colby eds). Jossey-Bass; pp 3-82
- Mehlum L (1999) Alcohol and stress in Norwegian United Nations peacekeepers. *Mil Med* **164**:720-724.
- Moreton-Cooper A (1984). The end of the rope. *Nurs Mirror* **159**: 16-19.
- New York State Education Department, Office of Health Professions. (n.d.). Education Law, Title VIII, Article 139. Accessed on February 14, 2010, at <http://www.op.nysed.gov/prof/nurse/article139.htm>.
- NHS Choices (2014). What should my daily intake of calories be? National Health Service (NHS), England. Available at <http://www.nhs.uk/chq/pages/1126.aspx?categoryid=51>
- Nightingale F (1969). *Notes on Nursing: What it is and What it is not*. London: D. Appleton and Company, reprinted by Dover Publications, New York.
- O'Hara MW, Schlechte JA & Lewis DA (1991). Controlled prospective study of postpartum mood disorders: psychological, environmental and hormonal variables. *J Abnorm Psychology* **100**:63-73.
- Ohman L, Nyberg L, Bergdahl, J & Nilsson LG. (2007). Longitudinal analysis of the relation between moderate and long-term stress and health. *Stress and Health*: **22**(2): 131-138

- Oliver G, Wardle J & Gibson L (2000). Stress and food choice: a laboratory study. *Psychosom Med* **62**:853-865.
- Onasoga Olayinka, OA & Osamudiamen OS (2013). Occupational stress management among nurses in selected hospital in Benin City, Edo state, Nigeria **3**(1): 473–481.
- Gray-Toft P & Anderson TG (1981). The nursing stress scale: Development of an instrument. *J Behav Assess* **3**: 11-23
- Gray-Toft P & Anderson TG (1981). "Stress among hospital nursing staff: Its causes and effects", in *Social Science and Medicine* 539-647.
- Prentice AM, Jebb SA (2003). Fast foods, energy density and obesity: a possible mechanistic link. *Obes Rev* **4**:187-194.
- Reverby S (1987). A caring dilemma: Womanhood and nursing in historical perspective. *Nurs Res* **36**(1):5–11.
- Schiffman SS, Graham BG, Sattely-Miller EA, Peterson-Dancy M (2000). Elevated and sustained desire for sweet taste in African-Americans: a potential factor in the development of obesity **16**: 886-893.
- Selye H (1956). *The stress of life*. New York: McGraw Hill
- Shea T., & De Cieri H (2011). Workplace stress evaluation tools: A Snapshot Review. Research report 1111-022.16-RR1. Faculty of Business and Economics, Monash University.
- Sherwood L (2001). *Human Physiology from Cells to Systems*. 4th ed. California: Brooks/Cole; 2001.
- Stedman's Electronic Medical Dictionary (2007). Version 7. Lippincott & Wilkins
- Takeda E, Terao J, Nakaya Y, Miyamoto K, Baba Y, Chuman H (2004) Stress control and human nutrition. *J Med Invest* **51**:139-45.
- Thompson F (2010). Need for technological innovation in dietary assessment, *J Am Diet Assoc* **110**:48.
- Torres SJ & Nowson CA (2007). Relationship between stress, eating behavior, and obesity. *Nutrition* **23**: 887–894.

- Vagg PR & Spielberger CD (1998). Occupational stress: Measuring job pressure and organizational support in the workplace. *J Occup Health Psychol* **3**(4): 294–305
- Van Doornen LJ & Orlebeke JF (1982). Stress, personality and serum cholesterol level. *J Human Stress* **8**: 24–29.
- Walcott-McQuigg JA (1995). The relationship between stress and weight-control behavior in African-American women. *J Natl Med Assoc.* **87**:427-432.
- Wardle J & Gibson EL (2002). Impact of stress on diet: process and implications. In: Stansfield S, Marmot M, editors. *Stress and the Heart. Psychosocial Pathways to Coronary Heart Disease*. London: BMJ publishing Group.
- Wardle J, Steptoe A, Oliver G. & Lipsey Z (2000). Stress, dietary restraint and food intake. *J Psychosoma Res* **48**(2): 195–202.
- Weibel L (2003). Methodological guidelines for the use of salivary cortisol as a biological marker of stress. *Presse Med* **32**(18):845-851.
- World Health Organization (2010). Obesity. Preventing and managing the global epidemic. Report of a WHO Consultation on Obesity. World Health Organization Geneva, WHO
- Winkel W (2009). Florence Nightingale. *Epidemiol* **20** (2): 311.
- Woodham- Smith C (1983). Florence Nightingale, 1910. New York: Atheneum

APPENDICES

APPENDIX I

UNIVERSITY OF GHANA

SCHOOL OF BIOMEDICAL AND ALLIED HEALTH SCIENCES

INFORMATION SHEET

I, **Nagumsi Nuhu**, wish to conduct a research on association between work related stress and dietary habits among nurses in two district level hospitals in Mampong-Akuapem. I am a Dietetic student of the School of Biomedical and Allied Health Sciences, College of Health Sciences, University of Ghana.

The Aim of the study is to determine the association between work related stress and dietary habits among nurses in two district level hospitals.

About 5ml of saliva will be taken from you to determine the levels of cortisol. Body height and weight will be measured to determine your BMI status.

The information provided by the participants will be kept confidential by the researcher. If the information is published in any scientific journal, you will not be identified by name. This study will contribute to the existing knowledge of work related stress and dietary habits among nurses in Ghana.

Participating in this study is voluntary without any costs. You are free to withdraw from the study at any point in time.

The results of saliva analysis will be given to participants to enable them know their levels of cortisol in relation to stress. The researcher will however be available and willing to answer any further questions about the research, now or during the course of the project.

CONSENT

I agree that the research project named above has been explained to my satisfaction and I agree to take part in this study. I understand that I am agreeing with my signature/thumbprint on form to take part in this research project and I understand I will receive a signed copy of this consent form for my records.

NAME OF STUDENT

DATE.....**SIGNATURE**.....

TELEPHONE

NUMBER.....

NAME OF SUPERVISOR 1.....

TELEPHONE NUMBER.....

NAME OF SUPERVISOR 2.....

TELEPHONE NUMBER.....

NAME OF PARTICIPANT.....

DATE..... **SIGNATURE/THUMBPRINT**.....

TELEPHONE

NUMBER.....

APPENDIX II**Food Frequency Questionnaire for Dietary Intake (Adopted from Asare J, 2011)****Participant's ID:****Date:****Section A: Socio-Demographic Status (Please Tick where applicable)**

1. Age of participants (years).....

2. Marital Status Married ☐ Divorced ☐ Widowed ☐
 Separated ☐

3. Religion Christianity ☐ Islam ☐
 Traditional ☐
 Others.....

4. Educational Background

Diploma Certificate ☐
Degree/Post Degree ☐

1. Rank of Nurses.....

Section B; Anthropometry

I. Weight..... (kg) II. Height..... (m) III. BMI.....

Section C: Food Frequency Questionnaire (Asare J, 2011)

Food Items	Daily	Weekly	2-3/Wk	Monthly	Occasionally	Never
Animal Protein (Meat, Fish, Snail, Egg, Liver, etc)						
Soft drinks & Sweets (Fanta, Coke, Malt, Yogurt, Fanice, etc)						
Vegetable Protein (cowpea, Beans, Soybeans, Bambara, Agushi, Cashew nuts, Groundnut, etc)						
Vegetables (Carrot, Cabbage, Nkontomere, Aleefu, Okro, Bitter leaf, etc)						
Cereals and Grains (Corn, Millet, Rice Sorghum, Oat, Wheat, etc)						
Tubers (Yam, Sweet Potatoes, Plantain, Cocoyam, etc)						
Fruits (Orange, Pawpaw, Pineapple, Banana, Watermelon, Pear, etc)						
Fruit Juice (Ceres, Don Simon, etc)						
Others (specify)						

24 Hour Recall

MEAL	TYPE OF FOOD	QUANTITY
Supper Time		
Late afternoon snack Time		
Lunch Time		
Midmorning snack Time		
Breakfast Time		

Section D: Stress Self-Test**Stress Self-Test © Professor Cary Cooper PhD**

Circle the appropriate number to show how often you have been troubled by the following:

0 = Never/rarely; 1 = Occasionally; 2 = frequently; 3 = Always/nearly always

	ON DUTY					OFF DUTY			
1. Constantly getting annoyed with people.	0	1	2	3		0	1	2	3
2. Difficulty in making decisions.	0	1	2	3		0	1	2	3
3. Loss of sense of humour.	0	1	2	3		0	1	2	3
4. Suppressed anger.	0	1	2	3		0	1	2	3
5. Difficulty concentrating.	0	1	2	3		0	1	2	3
6. Inability to finish one task before rushing into another.	0	1	2	3		0	1	2	3
7. Feeling you're the target of other people's animosity.	0	1	2	3		0	1	2	3
8. Feeling unable to cope.	0	1	2	3		0	1	2	3
9. Wanting to cry at the smallest problem.	0	1	2	3		0	1	2	3
10. Not interested in doing things after coming home from work.	0	1	2	3		0	1	2	3
11. Waking up and feeling tired after an early night.	0	1	2	3		0	1	2	3
12. Constant tiredness.	0	1	2	3		0	1	2	3
13. Lack of appetite.	0	1	2	3		0	1	2	3
14. Craving for food when under pressure.	0	1	2	3		0	1	2	3
15. Frequent indigestion or heartburn.	0	1	2	3		0	1	2	3
16. Constipation or diarrhoea.	0	1	2	3		0	1	2	3
17. Insomnia.	0	1	2	3		0	1	2	3
18. Tendency to sweat for no good reason.	0	1	2	3		0	1	2	3
19. Nervous twitches, nail biting, etc.	0	1	2	3		0	1	2	3
20. Headaches.	0	1	2	3		0	1	2	3
21. Cramps and muscle spasms.	0	1	2	3		0	1	2	3
22. Nausea.	0	1	2	3		0	1	2	3
23. Breathlessness without exertion.	0	1	2	3		0	1	2	3

24. Fainting spells.	0	1	2	3		0	1	2	3
25. Impotence or frigidity.	0	1	2	3		0	1	2	3
26. Eczema.	0	1	2	3		0	1	2	3
27. Dealing with death and dying.	0	1	2	3		0	1	2	3
28. Conflict with physicians.	0	1	2	3		0	1	2	3
29. Inadequate preparation to deal with the emotional needs of patients and their families.	0	1	2	3		0	1	2	3
30. Lack of staff support.	0	1	2	3		0	1	2	3
31. Conflict with other nurses and supervisors.	0	1	2	3		0	1	2	3
32. Workload.	0	1	2	3		0	1	2	3
33. Uncertainty concerning treatment.	0	1	2	3		0	1	2	3

Total score between 0-25 (Not many symptoms of Stress)

Total score between 26-52 (Moderate Stress)

Total score between 53-78 (Very High Stress)