

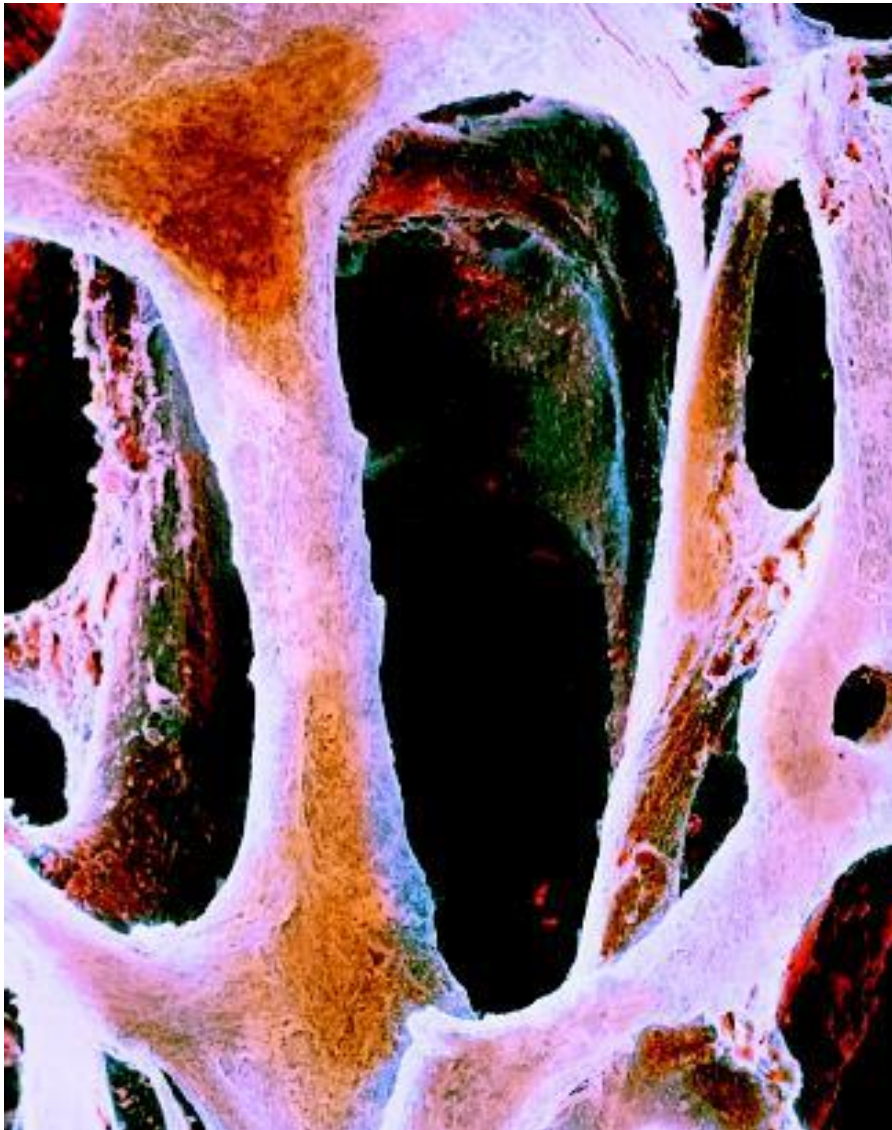
Adolescent girls' osteoporosis knowledge and understanding with analysis of their current lifestyle choices.

University of Chester

Centre for Exercise and Nutrition Science

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Debbie Michelle Kerfoot Savin



Abstract

Adolescent girls especially, need to be aware of the possible onset of osteoporosis in future years so that its effects can at least be reduced if not totally prevented. Recently, it has been reported that one out of three adolescent girls had neither heard nor read anything about osteoporosis (Gurney, 2007).

Research Objective

The aim of this research was to assess osteoporosis awareness and related behaviors amongst adolescent teenage girls with a view to help prevent osteoporosis occurring in later life.

Method

One hundred and forty two female students from a secondary comprehensive school aged 12-16 took part in a questionnaire.

The questionnaire consisted of 40 questions and was split into four sections:

Section A: An assessment of current osteoporosis knowledge.

Section B: An assessment of dietary and physical activity knowledge.

Section C: An assessment of current dietary intake for participant.

Section D: An assessment of current physical activity for participant.

General osteoporosis knowledge, risk factors, prevention, lifestyle behaviors, calcium intake, physical activity, smoking and alcohol intake were central aspects within the questionnaire.

The following hypothesis was tested: that adolescent girls have adequate osteoporosis, dietary and physical activity knowledge and understanding (Hi).

The null hypothesis (Ho) for this research was therefore given that adolescent girls have inadequate osteoporosis, dietary and physical activity knowledge and understanding.

Descriptive statistics, using excel were used to tabulate and analyse the data.

Results

Section A focused on osteoporosis knowledge. An average of 31% of questions were answered correctly (mean score of 7 out of 23 correct answers and a standard deviation of 4.4).

Section B focused on dietary and physical activity knowledge. An average of 57% of questions were answered correctly (mean score of 10 out of 18 correct answers and a standard deviation of 2.3).

Section C focused on an assessment of current dietary intake, most calcium consumption amongst the adolescent girls occurred around one to three times a week which consisted on average of seven to twenty one calcium containing products. The results from section C also showed other products such as cakes, buns, biscuits, pizza, cola and fizzy drinks were consumed amongst adolescent girls most frequently two to three times a month. Overall the results from section C showed that most adolescent girls consume calcium rich products more frequently than the other less healthier portions of food.

Section D focused on current physical activity levels, most of the adolescent girls spent two to four times a week participating in physical activity. Adolescent girls mostly tended to spend one to two hours per week and one two hours over the weekend watching the television (a relatively small proportion of their time). One to two hours was spent on homework during the week. Over the weekend one to two hours was also spent on homework.

Conclusions

The null hypothesis (Ho) that adolescent girls have inadequate knowledge and understanding of osteoporosis was confirmed as the adolescent girls' current knowledge of osteoporosis was found to be 'poor'. Their dietary and physical activity knowledge however, was found to be 'good'.

Overall this research supports the null hypothesis. The average percentage of correct answers in sections A and B was 44% equating to 'poor' osteoporosis and related dietary and physical activity knowledge.

Adolescent girls were generally unaware of osteoporosis issues and are currently doing moderate exercise and have a moderate consumption of calcium rich food, both of which must be increased to prevent the occurrence of osteoporosis in later life.

Targeted education programmes are needed and should be aimed at improving osteoporosis knowledge to affect health beliefs and lifestyle choices in a manner appropriate and appealing to these girls.

The National Osteoporosis Society is focusing on secondary education awareness in 2010.

Declaration

This work is original and has not been previously submitted in support of a Degree, qualification or other course.

Signed.....

Date.....

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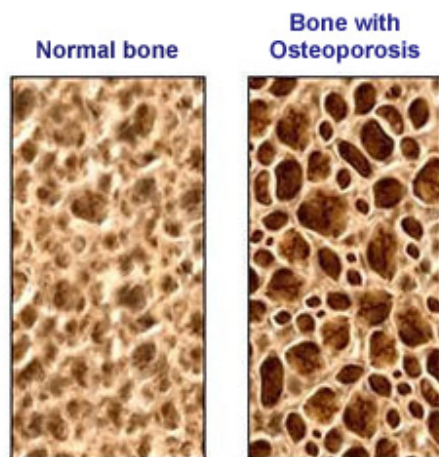
Chapter One: Raising osteoporosis awareness

1.1 Introduction to osteoporosis

Osteoporosis is a condition that causes bones to become brittle and prone to fracture. It is a degenerative disease, which can become painful and affects people's lives through the loss of mobility and independence. Osteoporosis affects women more than men (and mostly post menopausal women), however not all cases of osteoporosis are in the elderly. Although unusual, women can suffer from osteoporosis during their twenties and thirties.

Bones that are rich in calcium maintain a resilient internal structure that makes them more resistant to fracture. The National Health Service (2009) observes that 'Healthy bones are very dense, and the spaces within bones are small. In bones affected by osteoporosis, the spaces are larger, making the bones weaker and less elastic'

(National Health Service, 2009).



(Retrieved from: www.osteopathy.com)

Figure one: Osteoporosis visual

1.2 Osteoporosis epidemiology

Fractures caused by osteoporosis devastate lives, and not just for the individual. It oppresses society as a whole because of the large numbers of people affected, creating a burden on the NHS.

The World Health Organisation (WHO) 2009 state the most serious fractures as hip fractures, as they predominantly result in the sufferer requiring hospitalisation.

For about 20% of all cases, hip fractures are found to be fatal. For 50% of all sufferers a hip fracture can produce a permanent disability.

A perspective on the scale of osteoporosis comes from the extensive research of The National Osteoporosis Society, which identifies the critical nature of osteoporosis through the following three statements:

1. In the UK, one in two women and one in five men over the age of 50 will break a bone mainly because of poor bone health.
2. There are about 230,000 osteoporotic fractures every year.
3. 1,150 people are dying every month in the UK, equating to nearly 14,000 deaths per year in the UK, as a result of complications relating directly to hip fractures.

In January 2009, The National Osteoporosis Society (NOS) reported that there is a severe and increasing economic cost to bad bone health. At present the NHS and government funds allocate £1.7 billion per year and this figure is predicted to continue rising to a staggering £2.1 billion by 2020 which equates to £6 million a day. (National Osteoporosis Society, 2009).

1.3 Why women are more likely to be affected by osteoporosis than men

In National Osteoporosis Society literature (2009) it is stated that women are more likely to suffer from osteoporosis because women have smaller bones than men.

Women also experience the menopause, which accelerates the process of bone turnover. Bone is a living tissue which is constantly undergoing two processes of 'resorption' and 'formation' which increases the bone density, however after the age of thirty these two processes reverse and there is a greater bone loss than bone formation (NOS, 2009).

The WHO state that osteoporosis is most common in women experiencing loss of oestrogen supply to the bone cells during menopause, when it is called postmenopausal osteoporosis (WHO, 2009).

1.4 Bone nutrition - 'robbers'

Some substances in food require calcium for their metabolism, neutralisation and elimination. These substances withdraw calcium from the bone and subsequently increase bone loss.

As well as high protein and phosphate intake, Bartl (2004) observes the following four key factors that inhibit nutrition to the bone:

1. High Alcohol Intake

Alcohol inhibits the absorption of important building blocks for bone and damages the liver which is the organ required for activation of vitamin D.

2. Caffeine

Caffeine acts as a diuretic, causing increased urinary excretion of calcium and magnesium.

3. Sugar

About half the intake of carbohydrate food consists of sugar. The metabolism of sugar in the body utilises vitamins, minerals and valuable substances such as calcium. It also inhibits the uptake of calcium into the intestines.

4. Salt

High intake of salt, which is associated with high blood pressure, can also cause higher loss of calcium in the urine.

1.5 National Osteoporosis Society recommendations for osteoporosis prevention

The following six contributors play a part in preventing osteoporosis:

1. Healthy balanced eating
2. Adequate calcium intake
3. Sun exposure and vitamin D intake
4. Stopping/not smoking
5. Reducing alcohol intake
6. Participating in exercise

(National Osteoporosis Society, 2009).

1.6 Osteoporosis in children

During childhood and adolescence the occurrence of osteoporosis is rare.

When it does occur it is usually caused by prescription drugs or other illnesses such as; juvenile rheumatoid arthritis (by affecting bone growth), gland problems (the thyroid can accelerate bone loss) celiac disease, anorexia and bulimia (that affect nutrient absorption, especially calcium and vitamin D), osteogenesis imperfecta (a rare inherited gene defect), kidney disease and diabetes.

Osteoporosis can occur in children for no reason. This rare occurrence is called 'idiopathic osteoporosis'.

Osteoporosis in children exists when there is both low bone mass and history of a significant fracture. Outcomes for children with osteoporosis are generally good although in severe cases, childhood osteoporosis sufferers will require continuing support throughout the whole of their adult lives.

The research of Pye (2009), suggests that self reported previous fractures are not associated with an increased risk of future fracture and osteoporosis.

1.7 How awareness in childhood and adolescence years can help prevent the onset of osteoporosis in later life

The research of Fulghum (1993) from her published work 'Winning with Osteoporosis' found that late adolescent girls ages 14-18 especially, need to be aware of the possible onset of osteoporosis in future years so that it can be reduced/prevented.

Particular focus and awareness is desirable during the adolescent years, as bones are developing more rapidly than in the childhood years. Childhood awareness of osteoporosis is ideal for positive lifestyle choices through adolescent years to later life.

Bone mass density is vital for healthy bones as this is where calcium plays a crucial preventative role for the occurrence of osteoporosis in later life. If calcium is both taken and absorbed during teenage years there is a likelihood that bones will have maximum development and strength leading to a higher bone mineral density (BMD).

During the adolescent years the supply of bone within the body is built. The denser the bones become during these years the longer the density of the bones may last when the process of bone removal begins later in life.

This was supported by Sanders in the book "Eating for Good health" (1999); this states that osteoporosis becomes even more likely if a woman had poor BMD in early life, smokes or eats a low-calcium diet.

There is also evidence that lifestyle factors have a bearing on the onset of osteoporosis.

Cheng et al., (2002) did research into the changes in bone mass distribution induced by hormone replacement therapy and high-impact physical exercise in women. The findings showed that high-impact exercises such as treadmill walking, gymnastics, weight training, stepping, jumping, endurance and strength exercises all resulted in a more significant increases of bone mineral density, in post menopausal women showing early signs of osteoporosis, than those post menopausal women showing early signs of osteoporosis who had been induced by hormone replacement therapy alone.

Biddle (2004) looked at health-enhancing physical activity and sedentary behaviour in children and adolescents in association with the British Heart Foundation. It was found that in a review of the prevalence of physical activity and sedentary behaviours, many young children were active but this activity declines with age.

1.8 Adolescent girls and osteoporosis – the issue in context.

Once considered a fate for the elderly, society is now gradually accepting that osteoporosis is a crippling brittle bone disease that spans all demographics and that prevention of osteoporosis begins in childhood with a high connection to lifestyle factors. Poor diets link with the growth and development of the human skeleton, which requires an adequate supply of many different nutrients.

Diets low in calcium are of a particular concern. Calcium is the fundamental mineral needed for the prevention and treatment of Osteoporosis. The human body has over 1kg of calcium, 99% of which is contained within the skeleton. This means that a fifth of total bone mass is calcium (Bartl, 2004).

The early to mid teenage years (12-14) are a critical time for bone formation. Substantial evidence suggests that peak bone mass and later fracture risks are influenced by the pattern of growth in childhood and by nutritional exposures during childhood and adolescence (Gampiero, 2005).

Attention has been paid to the following two nutritional factors: Calcium and Vitamin D.



(retrieved from: www.calciumeveryday.com)

Figure two: The effect of Vitamin D on calcium absorption in the bones.

Figure two illustrates two bones with the circles representing calcium. The first bone represents a lack of vitamin D within the body and the second bone represents the presence of vitamin D within the body. This figure clearly shows that when vitamin D is present within the body it enables greater absorption of calcium in the bones (Kiger, 2004). As the skeleton develops and grows, a calcium rich diet provides the building blocks required to reach a peak bone mass at around 25 years of age (Bartl, 2004).

During the age of adolescence up to the age of twenty-five, the process of bone construction outperforms the process of bone deconstruction. After thirty this process reverses. During this growing period children and young adolescents need about four times as much calcium as adults per kilogram of body weight (Gampiero, 2005). Weight conscious adolescents can achieve the recommended 800-1000 mg of calcium per day by means of calcium rich low fat versions of cheese, milk and yoghurts (Gampiero, 2005). Recommendations from the Department of Health (2009) on osteoporosis suggest; greater consumption of calcium, optimise vitamin D intake through adequate summer sunshine exposure and to increase physical activity.

By the time osteoporosis is diagnosed in many individuals, it has advanced and the success of dietary intervention would be limited. Bailey et al, found that the peak bone mineral content velocity occurs in boys at 14 years while for girls this is earlier at 12 years. Bone mass increases progressively during childhood, but mainly during adolescence when approximately 40% of total bone mass is accumulated. Peak bone mass is reached in late adolescence. Therefore highlighting peak bone mass can prevent osteoporosis occurrence in later life. This research is vital when looking at the osteoporosis epidemic (Bailey, 2008).

Variations in calcium intake early in life can account for a 5-10% difference in peak bone mass (Albertson, 1997) giving an increased chance of osteoporosis. Concern was made in a 2005 study assessing sedentary girls aged 12-18 and it was estimated that half had already compromised their bone density, (Matkovic, 1990) this was due to a lack of regular exercise which constitutes a sedentary lifestyle.

The National Osteoporosis Society uses the term 'bone bank' in relation to the adolescence years and connects the analogy with choices made with diet and nutrition to making "deposits" and "withdrawals" of bone tissue.

1.9 Adolescent girls – current life style factors

In November 2008, a national news article highlighted a development of the ‘modern adolescent girl’ making lifestyle choices that compromised achieving a peak bone mass crucial for the prevention of osteoporosis in later life (Beun Chen, 2008).

In fact, the article stressed a new epidemic of ‘the young’ developing osteopenia, the medical term for low bone density and in some cases, full-blown osteoporosis (Beun Chen, 2008).

Risk factors for adolescent females are smoking, low body weight (through dieting), lack of weight bearing exercise and the use of contraceptive pills which are contributing factors, detrimental to the build up of healthy bone. Young girls suffering from anorexia risk lower levels of the hormone oestrogen, which subsequently has a negative effect on bone formation.

This makes the life style of adolescents of vital importance for preventing osteoporosis with the main focus being on nutrition, detrimental habits such as smoking and alcohol abuse, weight loss regimes and taking weight loss drugs along with lack of exercise and physical activity.

Public health and promotion 2005 (Naidoo, 2005) suggests the main approaches to changing individuals behaviour are through providing information and addressing factors enabling healthier choices.

1.10 Naturally Beautiful Campaign

Only one government backed campaign in 2005, funded by the Milk Development Council (MDC), urged adolescent females to eat more dairy products and in a multi million pound initiative was aimed at defusing the onset of osteoporosis in later life, otherwise dubbed 'the osteoporosis time bomb' (Maguire, 2005). For the first time the government encouraged young females to raise their calcium intake by highlighting its benefits for the skin, hair and bones.

The MDC found that part of the problem in society was adolescent girls' perceptions that all dairy products are fattening and thus they were being avoided. Adolescent girls were therefore not consuming the recommended 800mg of calcium per day creating a higher percentage of osteoporosis risk. This information is important as it equates to a trend that could have massive implications leading to increased amounts of women developing osteoporosis in later life. This campaign highlights how more intervention is necessary in order to help adolescent girls become aware of osteoporosis.

Purdie, 2005 stated how essential it is for adolescent girls to have enough calcium in their diets along with physical activity to maintain the upward trajectory of resilience in their bones.

If adolescent girls do not reach the requirements of at least 800mg of calcium daily and 20 minutes each day exercise, bone density will be compromised for later life and they will be at a higher percentage risk of developing osteoporosis.

One of the biggest factors experts have found contributing to undesirable lifestyle choices, is a lack of understanding and awareness for adolescent girls on osteoporosis prevention (Gurney, 2007)

Findings from the diet and nutrition survey in 2000 found that adolescents aged 15-18 had a poor dietary knowledge with regards to osteoporosis (Lowe, 2000).

Rutherford states that the chosen lifestyle can have a positive effect on the quality of life and prevention of osteoporosis for many individuals (Rutherford, 2004).

1.11 Current 2009 guidelines for osteoporosis prevention

The current recommendations from the Nation Health Service (NHS, 2009) are that there are three main contributing factors, which if addressed appropriately by individuals through lifestyle choices, will keep bones healthy and therefore reduce the likelihood of osteoporosis developing.

1. Lifestyle
2. Exercise
3. Diet

2009 Lifestyle choice recommendations include not smoking (as smoking can cause early menopause) and not drinking too much alcohol. Both smoking and drinking have negative effects on bone structure.

2009 Exercise recommendations are thirty minutes of weight bearing exercise daily. These physical activities can include running, skipping, aerobics, tennis, dancing, weight training and brisk walking (NHS, 2009).

2009 Dietary recommendations suggest a well-balanced range of foods. Foods rich in calcium are especially valuable for healthy bones. A diet including bread, potatoes, pasta and cereals, fruit, vegetables, milk and dairy products should provide the nutrients the skeleton needs to be healthy. Other particularly good sources of calcium are cheese, yoghurt, soya-beans and products derived from soya such as tofu, green leafy vegetables and dried fruit.

High intakes of caffeine (more than four cups of coffee daily), salt and fizzy drinks have detrimental effects on the amount of calcium uptake (BUPA, 2009) as these can inhibit nutrient absorption within the body.

The 2009 UK recommended calcium intake is 700 milligrams per day for adults and for adolescent girls between the ages of 11 to 18 the recommended daily intake is 800-1000 milligrams per day (NOS, 2009).

Vitamin D promotes bone formation by improving intestinal absorption of calcium and phosphate by stimulating maturation and mineralisation within the bones (Bartl, 2004).

Vitamin D is essential in order for the bones to absorb calcium properly. As the best possible source of vitamin D is exposure to sunlight, recommendations for 2009 are 15-20 minutes of sun exposure, three to four times a week from April to September each year thus enabling the body to store enough vitamin D. Other sources of vitamin D are egg yolks, oily fish and fortified margarine (BUPA, 2009).

1.12 Research on adolescent girl's and women's knowledge and understanding of osteoporosis

Existing research supports the need to raise awareness of osteoporosis prevention.

In 1999 a survey was undertaken on 16 year-old females in Britain. The purpose of this study was to investigate the knowledge of 16 year-old girls on osteoporosis and related issues. One hundred and nineteen structured multiple choice questionnaires were completed across five schools in the Borough of Wolverhampton, UK. The questionnaires consisted of twenty-four questions, which related to their current diet, exercise and general knowledge. Results from this study gave a mean answer score of nine out of twenty four correct answers (37.5 %) which concluded that knowledge amongst this adolescent age group studied was found to be “very poor” (Davis, 1999).

Carbonated drink consumption was addressed in 2003 and found that adolescent girls were amongst the highest consumers. This is significant because carbonated drinks have been found to have a detrimental effect on bone health as Bartl (2004) dubbed carbonated drinks as a bone-nutrition ‘robber’ (Wyshak, 2000).

In 2003 a study on whether increases in calcium intake and physical activity effectively increase the bone mineral status of adolescent girls aged 16–18 was conducted for Human Nutrition Research, in Cambridge, UK.

The study found that calcium supplementation and exercise did enhance bone mineral status. However, whether this is a lasting benefit, leading to the optimization of peak bone mass and a reduction in fracture risk, still needs to be determined and further research must be conducted (Stear, 2003).

A study with one hundred and fifty three questions on osteoporosis prevention was conducted in Singapore in 2005. The main objective of the study was to create awareness for women in Singapore and help the prevention of osteoporosis.

This study was structured with questions relating to four headings;

About the participants, risk factors of the participants, participant osteoporosis opinions and osteoporosis facts. This study was handed out to one hundred and six females.

The results found that only 29.6% of 15-20 year olds consumed an adequate amount of calcium from milk and the majority of these females had no concern towards bone health and their knowledge of osteoporosis was limited (Liew, 2005).

Awareness including the health beliefs of women related to osteoporosis was looked at in Turkey in 2005. Seven hundred and sixty eight 40-70 year olds completed a questionnaire on osteoporosis awareness, perception and knowledge sources of osteoporosis. Results showed that younger women were more aware of osteoporosis due to television and other forms of media (Saw, 2005).

In 2005 Canning studied osteoporosis knowledge, calcium intake and physical activity levels in Irish adolescent females. This was a cross sectional study of fifty-six 14-18 year old female students attending public school in Ireland.

The results found that most participants knew the essential facts about osteoporosis, such as; the relationship between osteoporosis and being a woman, having adequate calcium intake and participating in physical activity yet they had limited knowledge on all aspects of bone health. This limited knowledge on bone health related to the benefits of vitamin D and weight bearing exercise. Overall this research concluded that although knowledge may not necessarily influence behaviour, education of adolescents could be the first step in the prevention of osteoporosis (Canning, 2005).

In 2006 osteoporosis awareness and related behaviours were looked at in Dubai.

The purpose of this study was to assess osteoporosis related behaviours amongst a multi-cultural sample of women in Dubai.

Two questionnaires were administered and emailed to women aged 17 and over.

The first questionnaire of twenty-one questions covered osteoporosis knowledge, risk factors and prevention.

The second questionnaire covered lifestyle choices such as; calcium intake, physical activity, smoking and alcohol consumption. Bone mass density scans were also covered. Low osteoporosis knowledge was found and subsequently the majority of subjects practiced borderline high-risk behaviours relative to osteoporosis. This research supports the need to raise awareness in adolescent females and change their behaviours in order to prevent the onset of osteoporosis (Lobban, 2006).

In 2007 a study in schools in Bedfordshire, UK, looked at high-risk osteoporosis, knowledge and relative high-risk behaviors.

This study focused on the knowledge of adolescents and their related health beliefs in connection with osteoporosis. It also examined whether preventative behaviours are being practiced. Two hundred and seventy five 16-18 year olds were researched in full time education through questionnaires. There was an 81% response rate giving two hundred and nineteen usable questionnaires. Almost a third of all participants reported that they had heard or read nothing about osteoporosis. The participants perceived no significant difference between developing HIV/AIDS or Alzheimer's when compared to osteoporosis.

Fifty two percent (61/117 females) rated their likelihood of being affected by osteoporosis as "low" and over fifty percent (67/117 females) did not appear to recognise the relationship between menstruation, menopause and the disease of osteoporosis. Sixty two percent (73/117 females) felt that they were not personally responsible for developing osteoporosis. The results showed that there was a lack of knowledge and little perceived importance of osteoporosis amongst this age group (Gurney, 2007).

1.13 Current 2009 research relating to adolescent girls and lifestyle choices

Rahnavard (2009) raised further concern for adolescent girls existing lifestyle habits in Iran. This research was conducted to determine adolescent girls lifestyle choices in relation to the prevention of osteoporosis.

Life style activities are seen to be the crucial first step in the process of preventing osteoporosis. Lifestyle has been identified as routine daily activities chosen by individuals and these activities affect the individual's health conditions in later life. (Rahnavard, 2009)

In 2009, seven hundred and sixty female students were chosen randomly by a cluster sampling method in Tehran, Iran. The participants were not suffering from any kind of physical or mental disease and had no dietary limitations.

A two-part questionnaire was handed out. The first part was concerned with demographic characteristics and the second included some information on factors such as nutrition, exercise and physical activity plus lifestyle habits such as smoking, weight loss programmes and taking weight loss drugs. The students' answers were split into three categories, unfavourable, partially favourable and favourable.

The research found that fifty two percent of adolescent girls did not participate in any form of physical activity. Over fifty percent of female's lifestyle choices were placed into the unfavourable category (Rahnavard, 2009).

1.14 Justification for this research

The consensus of all the research found, past and present, either suggests or confirms that raising awareness amongst adolescent girls is essential for long term health in relation to osteoporosis.

The responsibility for a person's health lies strongly, but not completely, on that individual. Collective and expert responsibilities by society as a whole should be addressed (Kiger, 2004).

In conducting this research, the issue of osteoporosis is highlighted and by providing the factual evidence of osteoporosis to the adolescent girls, it helps raise the participants awareness of osteoporosis prevention.

1.15 Rationale for undertaking research on the knowledge, attitudes and behavior towards osteoporosis amongst adolescent girls

Fundamentally, the reason for conducting this research was to assess osteoporosis awareness and related behaviors' amongst adolescent teenage girls and help prevent osteoporosis occurrence in later life.

1.16 Hypothesis to the osteoporosis research

The null hypothesis to this research was that there is inadequate knowledge and understanding of osteoporosis in adolescent girls.

The questionnaire therefore targeted six specific areas:

- Adequacy of adolescent girls' knowledge of osteoporosis for the prevention of the condition.
- Adequacy of adolescent girls' knowledge of dietary recommendations in relation to the prevention of osteoporosis.
- Adequacy of adolescent girls' knowledge of physical activity recommendations in relation to the prevention of osteoporosis.
- Adequacy of adolescent girls' current dietary behaviour in relation to the prevention of osteoporosis.
- Adequacy of adolescent girls' current physical activity behaviour in relation to the prevention of osteoporosis.
- Adequacy of adolescent girls' overall knowledge and behaviour for diet and exercise in relation to the prevention of osteoporosis.

On completion of the questionnaire, the findings of my research have been passed onto the National Osteoporosis Society in the hope that they will be able to incorporate the findings into their osteoporosis awareness programme.

Chapter two: Method

2.1 Study overview

A questionnaire was chosen as the best method of research.

The advantages of choosing a questionnaire based study is the quantitative, economical and anonymous way in which it is structured. There are four sections covering the main aspects of osteoporosis awareness and prevention that were used.

Kingdown Comprehensive School, in Wiltshire, UK gave permission for the research to be carried out. Please refer to letter of approval (**Appendix A: School permission**).

2.2 Participants

A cross sectional sample, chosen at random by the head teacher, of two hundred 12-16 year old female students were asked to complete the questionnaire. This was seen to be a representative sample size however out of the two hundred participants 142 completed questionnaires were handed back.

2.3 Study design

This study was designed on the basis of six contributors playing a vital part in preventing osteoporosis recognised from the National Osteoporosis Society (2009), namely:

1. Healthy balanced eating
2. Adequate calcium intake
3. Sun exposure and vitamin D intake
4. Stopping smoking
5. Reducing alcohol intake
6. Participating in exercise

(As previously identified in section 1.5)

The questionnaire was structured on the above and each contributor was assessed in relation to adolescent girls prevention of osteoporosis.

The outcomes of the questionnaire to be addressed were:

How does osteoporosis knowledge link to dietary behaviour?

How does osteoporosis knowledge link to physical activity behaviour?

How does dietary knowledge link to dietary behaviour?

How does physical activity knowledge link to physical activity behaviour?

The questionnaire was split into four categories:

Section A: An Assessment of Current Osteoporosis Knowledge

Section B: A two-part assessment;
B1 focused on Dietary Knowledge
B2 focused on Physical Activity Knowledge

Section C: An Assessment of Current Dietary Intake for Participants

Section D: An Assessment of Current Physical Activity for Participants.

(Appendix B: Questionnaire)

Having conducted a small pilot study, questionnaires from five girl guides aged 12-16, it was noted that the questionnaire response time could be assumed to take between 10 and 15 minutes. In practice a 20-minute response time was given.

2.4 Procedure

- The questionnaire was handed out between 15-19th June 2009 during tutorial time across 13 tutor groups. These were chosen by the head teacher and covered a random cross section of girls within the school.
- 200 female students were asked by their tutors to individually complete the questionnaire at school.
- Kingdown Sports Community College segregates its students into mixed sex and mixed aged tutor groups and each tutor was asked to select only 12-16 year old girls to participate in this study.
- After the tutor had been through the set of standardised instructions (approved by the ethics committee) and offered preferred anonymity to complete the questionnaire, each participating girl was given 20 minutes to complete the questionnaire individually without help.

(Appendix C: Questionnaire standardised instructions)

- 200 questionnaires were given out in total. No verbal feedback was asked for.
- From the 142 completed responses, results were tabulated and statistical analysis was then conducted.

2.5 Additional materials

Permission was granted, to carry out research by the National Osteoporosis Society in conjunction with their educational mission (**Appendix D: National Osteoporosis Society correspondence**). A National Osteoporosis Society pamphlet was handed out to each participant upon completion of the questionnaire and pamphlets were also handed out to adolescent girls who were asked but did not complete the questionnaire. This was aimed to help inform and enhance adolescent girls existing knowledge and understanding of osteoporosis.

2.6 Ethical approval

Ethical approval was received for this research project from the Faculty of Applied and Health Sciences, University of Chester Research Ethics Committee in May 2009 (**Appendix E: Ethical approval for research**).

2.7 Statistical/Data Analysis

Descriptive statistics provided the primary analyses.

Frequencies were tabulated for the individual question responses.

Section A was summed to yield a knowledge score out of 23 questions

Section B was summed to yield a knowledge score out of 18 questions

Section C provided an indication of the likelihood of inadequate calcium intake.

Section D provided an indication of the likelihood of inadequate physical activity level.

In order to assess sections A and B for overall significance it was important that the findings were analysed statistically.

It was expected that there would be a correlation between the amount of knowledge the adolescent girls have on osteoporosis and the regular dietary and physical activity patterns of the girls.

From the structured questionnaire it was decided that the following cut-off points would apply.

Table 1: Questionnaire cut-off points

Percentage of correct answers	Assessment based on question
0-25%	Very poor
26-50%	Poor
51-75%	Good
76-100%	Excellent

The following hypothesis was tested:

Adolescent girls have adequate osteoporosis, dietary and physical activity knowledge and understanding (Hi).

The null hypothesis (Ho) for this research was therefore assumed that adolescent girls have inadequate osteoporosis, dietary and physical activity knowledge and understanding.

Chapter three: Results

3.1 Section A: General osteoporosis knowledge.

The aim of this section was to assess adolescent girls current awareness of osteoporosis and identify any gaps in their knowledge.

This section was covered by 23 questions focusing on the likelihood of getting osteoporosis from a variety of different factors.

Four multiple-choice answers were given; 'more likely', 'less likely' 'nothing to do with' and 'don't know'.

Overview comments and observations for section A

- The adolescent girls osteoporosis knowledge was generally poor.
- Some questions answered were found to be exceedingly poor.
- The percentage of correct answers in section A was found to be 'poor'.

Table 2: Section A result summary

Question number and related topic	Correct answer	Incorrect answer	Don't know answer	Proportion correct
1.The association of getting osteoporosis in relation to 'being a woman'.	89	23	30	63% of girls answered correctly that osteoporosis is 'more likely' to occur in women.
2.The association of getting osteoporosis in relation to 'being a man'.	79	41	22	56% of the adolescent girls answered correctly that osteoporosis is 'less likely' to occur in men.
3.The association of osteoporosis in relation to 'being white'.	6	93	43	4% of the adolescent girls asked knew that a white person's bones are less dense than an Asian person's.
4.The association of osteoporosis in relation to 'being Asian'.	5	82	55	4% of the adolescent girls asked knew that osteoporosis is 'more likely' to occur in white people.
5.The association of osteoporosis in relation to 'having a mother with osteoporosis'.	96	35	11	The response from the adolescent girls was the highest correct answer in section A. 68% percent of girls correctly answered that osteoporosis is more likely to occur if your mother has osteoporosis.
6.The association of osteoporosis in relation to 'having a mother who is not as tall as she used to be'.	21	73	48	15% of girls correctly answered that it is 'more likely' if her height was reduced as she grew older.

Question number and related topic	Correct answer	Incorrect answer	Don't know answer	Proportion correct
7.The association of osteoporosis in relation to 'being overweight'.	16	54	72	Being overweight is not associated with osteoporosis only 11% of the adolescent girls asked were aware of this.
8.The association of osteoporosis in relation to 'being underweight'.	64	17	61	Being underweight is associated with having osteoporosis as a BMI (Body Mass Index) below 19kg/m ² often means bones are smaller and finer so osteoporosis is more likely as bone loss increases during later life. Only 45% of the adolescent girls asked were aware of this.
9.The association of osteoporosis in relation to 'having big bones'.	30	45	67	Having big bones is not related to having osteoporosis. 21% of the adolescent girls asked were aware of this.
10.The association of osteoporosis in relation to 'being anorexic'.	84	29	29	Being anorexic and having a low BMI is largely associated with both adolescent girls and having osteoporosis. 59% of the adolescent girls asked were aware of this.
11.The association of osteoporosis in relation to 'being on a diet'.	31	72	39	Being on a diet can be associated with missing out key dairy and calcium containing foods. 22% of girls answered that you are 'more likely' to get osteoporosis when dieting.

Question number and related topic	Correct answer	Incorrect answer	Don't know answer	Proportion correct
12.The association of osteoporosis in relation to 'making sure you have adequate calcium intake'.	71	22	49	Making sure each individual has adequate calcium intake is essential in the prevention of osteoporosis. 52% of the adolescent girls answered this question correctly.
13.The association of osteoporosis in relation to 'eating a diet high in green leafy vegetables'.	51	47	44	Eating a diet including green leafy vegetables is beneficial to bones health and yet only 38% of adolescent girls answered this question correctly.
14.The association of osteoporosis in relation to 'eating enough dairy products'.	74	32	36	Eating enough dairy products is essential for osteoporosis prevention and 52% of the adolescent girls answered this correctly.
15.The association of osteoporosis in relation to 'having a low vitamin D intake'.	37	78	27	Having a low vitamin D intake inhibits calcium intake for the bones. 28% of adolescent girls asked were aware of this.
16.The association of osteoporosis in relation to 'having a low vitamin A intake'.	7	94	41	Only 5% of the adolescent girls asked correctly answered that Vitamin A is not related to osteoporosis prevention.
17.The association of osteoporosis in relation to 'taking adequate exercise'.	71	34	37	Exercise is essential to keep bones healthy and 50% of the adolescent girls asked were aware of this.

Question number and related topic	Correct answer	Incorrect answer	Don't know answer	Proportion correct
18.The association of osteoporosis in relation to 'taking weight bearing exercise'.	30	65	47	Weight bearing exercise in particular is essential for bone health. 21% of the adolescent girls answered this correctly.
19.The association of osteoporosis in relation to 'not drinking too much alcohol'.	37	59	46	28% of the adolescent girls asked were aware that alcohol has an adverse effect on the body and bone health.
20.The association of osteoporosis in relation to 'not smoking'.	47	63	32	33% of adolescent girls recognised that smoking has a detrimental effect on bone health.
21.The association of osteoporosis in relation to 'going through the menopause'.	23	73	46	Only 16% of adolescent girls were aware that going through the menopause reduces bone mineral density and is a factor, which contributes to osteoporosis.
22.The association of osteoporosis in relation to 'having your ovaries surgically removed'.	8	76	58	A woman with ovaries surgically removed has a higher risk of developing osteoporosis. Only 6% of the adolescent girls asked were aware of this.
23.The association of osteoporosis in relation to 'having good posture'.	46	14	82	32% of adolescent girls asked were aware that good posture benefits the bones.
	Total answered correctly	Total answered incorrectly	Total 'don't know' answers	
	1023	1221	1022	

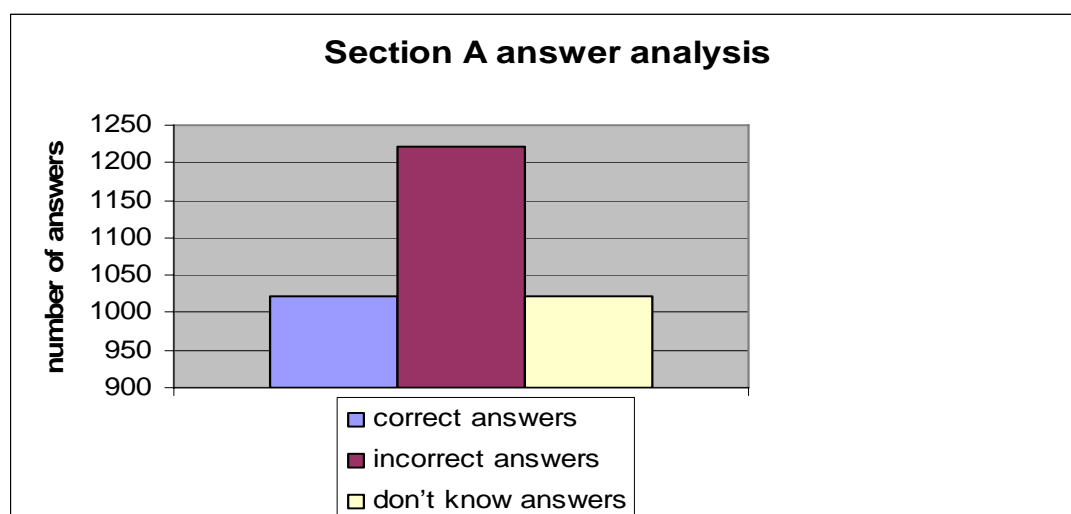


Figure three: Section A answer analysis

Figure three shows the majority of answers from all 142 adolescent girl participants were in the 'incorrect' categories (1221) rather than 'correct' and 'don't know' categories that had very similar response rates (1023 and 1022).

Table 3: Data analysis that indicates poor knowledge levels in section A

Mean score (out of 23)	7
Median score (out of 23)	7
Mode score (out of 23)	9
Standard Deviation	4.4
Range	17
Lowest score	0
Highest score	17
Total number of correct answers	1023
Number of questionnaires	142

Table 3 shows the mean adolescent girls score was 7 correct questions out of 23 for section A. The standard deviation of the results in section A was 4.4.

Table 4: Overall 'poor' knowledge percentage for section A

Overall a 'poor' knowledge rate was derived by working out of all the possible 3266 answers for section A (23 questions x 142 respondents) only 1023 were answered correctly.

Equating to **31%** correct osteoporosis answers in section A.

38% (1221) of questions were answered incorrectly.

31% (1022) of adolescent girls responded that they did not know the answer.

Table 5: Result of section A assessment based on question cut off points (table:1)

Percentage correct answers in section A	Percentage category	Assessment based on table
31%	26-50%	Poor

Table 5 shows that as the total percentage of correct answers in section A was 31%. It falls within the 'poor' osteoporosis knowledge in this assessment.

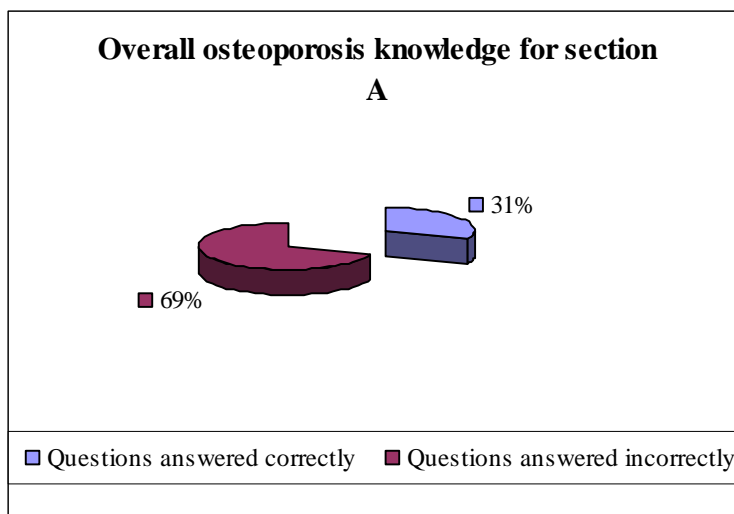


Figure four: Overall osteoporosis knowledge for section A

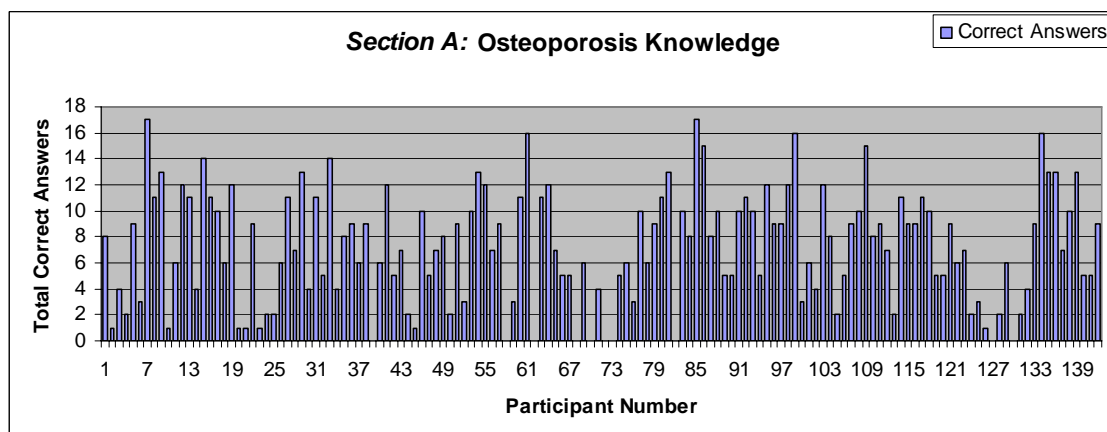


Figure five: Individual adolescent girls' correct number of responses: section A

Figure five shows that the highest number of questions answered correctly in this section was 17 and the lowest number of questions answered correctly was 0. There is a great variation in the number of correct answers in this section.

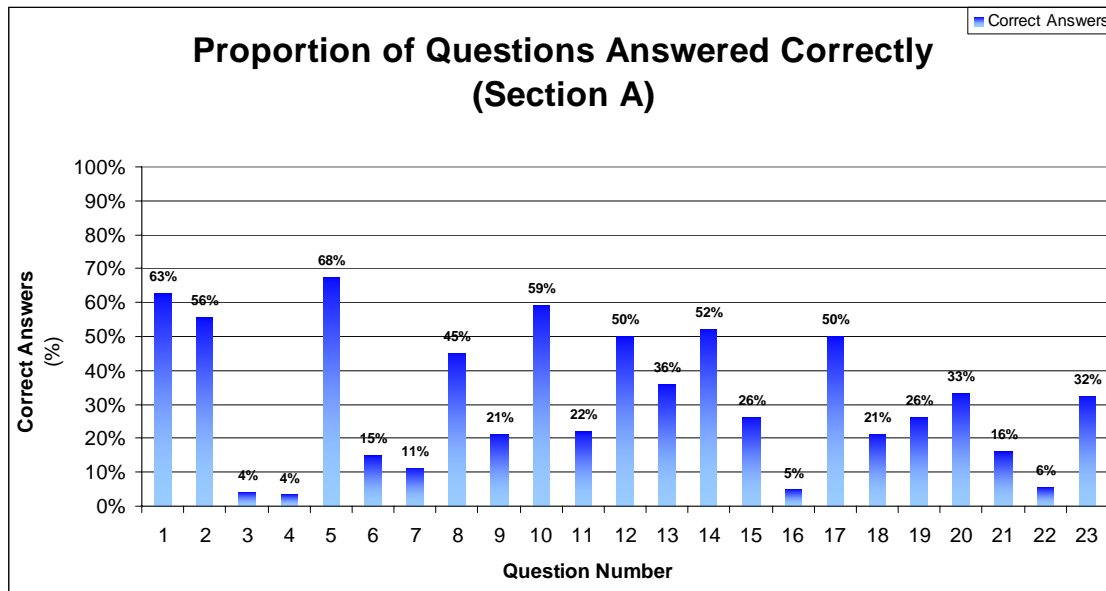


Figure six: The proportion of students who answered each question correctly in section A

In figure six: The remaining proportion of results not shown does not simply mean that the adolescent girls answered incorrectly, they may not have recorded an answer.

- Only 4 out of the 23 questions were answered correctly by more than half the adolescent girls.
- For 10 questions less than a quarter of the adolescent girls answered correctly.

Table 6: Further analysis of questions that had a particularly low correct response in section A.

Question number	Number 'correctly answered'	Number 'incorrectly answered'	Number answered as 'don't know'
3	6	93	43
4	5	82	55
16	7	94	41
22	8	76	58

Table 6 shows that the majority of these questions were answered 'incorrectly'.

3.2 Section B: General osteoporosis knowledge.

The aim of this section was to assess adolescent girls' current dietary and physical activity awareness and identify any gaps in their knowledge.

This section was covered by 18 questions focusing on calcium containing food products, specific calcium recommendations, the source of vitamin D, beneficial weight bearing exercises and exercise recommendations.

Multiple-choice answers were given for all questions with the exception of question 10 where participants were asked to clearly state a vitamin D source.

Overview comments and observations for section B

- The adolescent girls' dietary and physical activity knowledge was better than their osteoporosis knowledge.
- Some questions answered were found to be in the excellent category.
- The percentage of correct answers in section B was found to be 'good'.

Table 7: Section B result summary

Question number and related topic	Correct answer	Incorrect answer	Don't know answer	Proportion correct
1.The food that provides most calcium out of; 'Cheese' 'Cucumber' and 'Apple'.	137	3	2	'Cheese' contained the most amount of calcium. 96% of the adolescent girls asked were aware of this.
2.The food that provides most calcium out of; 'Yoghurt' 'Grapefruit' and 'Cabbage'.	133	5	4	'Yoghurt' contained the most amount of calcium. 94% of the adolescent girls asked were aware of this.
3.The food that provides most calcium out of; 'Ice-cream' 'Grapefruit' and 'Tomatoes'.	118	17	7	'Ice- cream' contained the most amount of calcium. 83% of the adolescent girls asked were aware of this.
4.The food that provides most calcium out of; 'Chicken' 'Grapes' and 'Baked Beans'.	49	76	17	'Baked beans' contained the most amount of calcium. Only 35% of the adolescent girls asked were aware of this.
5.The food that provides most calcium out of; 'Corn' 'Potatoes' and 'Tinned Sardines'.	25	39	78	'Tinned sardines' contained the most amount of calcium (calcium within the fish bone). Only 18% of the adolescent girls asked were aware of this.
6.The food that provides most calcium out of; 'Spinach' 'Carrots' and 'Mushrooms'.	78	24	40	'Spinach' contained the most amount of calcium. 55% of the adolescent girls asked were aware of this.

Question number and related topic	Correct answer	Incorrect answer	Don't know answer	Proportion correct
7.The food that provides most calcium out of; 'Tofu' 'Bacon' and 'Sausages'.	115	13	14	'Tofu' provides the highest amount of calcium. 81% the adolescent girls asked were aware of this.
8.The recommended daily amount of calcium for a teenage girl out of '600-800mg', '800-1000mg' and '1000-1200mg'.	91	27	24	64% of the adolescent girls asked were aware of '800 - 1000mg' being recommended by the National Osteoporosis Society for the daily allowance of calcium in the UK (NOS, 2009).
9.The required amount of half pint glasses of milk per day to achieve the recommended daily calcium intake out of, '1-2', '3-4' and 5+.	84	33	25	'3-4 glasses of milk' are recommended by the NOS (2009) to provide enough calcium per day. 59% of the adolescent girls asked were aware of this.
10.Apart from food sources and supplements a good source of vitamin D is	54	54	34	The 'sun' is a good source of vitamin D aside from vitamins. Only 38% of the adolescent girls asked were aware of this.
11.The exercise that is most beneficial for bones out of; 'Jogging', 'Cycling' and 'Horse-riding'.	59	58	25	Out of three exercises 'jogging' was the healthiest option for bones. 42% of the adolescent girls asked recognised this.
12.The exercise that is most beneficial for bones out of; 'Dancing', 'Yoga' and 'Swimming'.	17	26	99	'Dancing' was the best option for healthy bones. Only 12% of the adolescent girls asked were aware of this.

Question number and related topic	Correct answer	Incorrect answer	Don't know answer	Proportion correct
13.The exercise that is most beneficial for bones out of; 'Water polo', 'Football' and 'Cycling'.	33	68	41	'Cycling' was the best option for healthy bones. Only 23% of the adolescent girls asked were aware of this.
14.The exercise that is most beneficial for bones out of; 'Walking', 'Rowing' and 'Lifting Weights'.	67	32	43	'Walking' was the best option for healthy bones. 23% of adolescent girls asked were aware of this.
15.The exercise that is most beneficial for bones out of; 'Snooker', 'Basketball' and 'Skateboarding'.	118	12	12	'Basketball' was the best option for healthy bones. 47% of the adolescent girls asked were aware of this.
16.The recommended days per week you should exercise for out of; 'Once', '3-5 times' and '6-8 times'.	111	6	25	Healthy adults should exercise 3-5 times per week. 78% of the adolescent girls answered this correctly.
17.The recommended duration of exercise out of; 'less than 15 minutes', '20-30 minutes' and more than 60 minutes'.	79	4	59	'20-30 minutes' was the preferred response for ideal exercise duration. 56% of the adolescent girls asked were aware of this.

Question number and related topic	Correct answer	Incorrect answer	Don't know answer	Proportion correct
18. Breath inhalation during exercise should be; 'A little faster', 'much faster but able to talk' and 'much faster but unable to talk'.	88	18	36	Breathing inhalation during exercise should be 'faster but able to talk'. 62% of the adolescent girls answered this correctly.
	Total answered correctly	Total answered incorrectly	Total 'don't know' answers	
	1456	515	585	

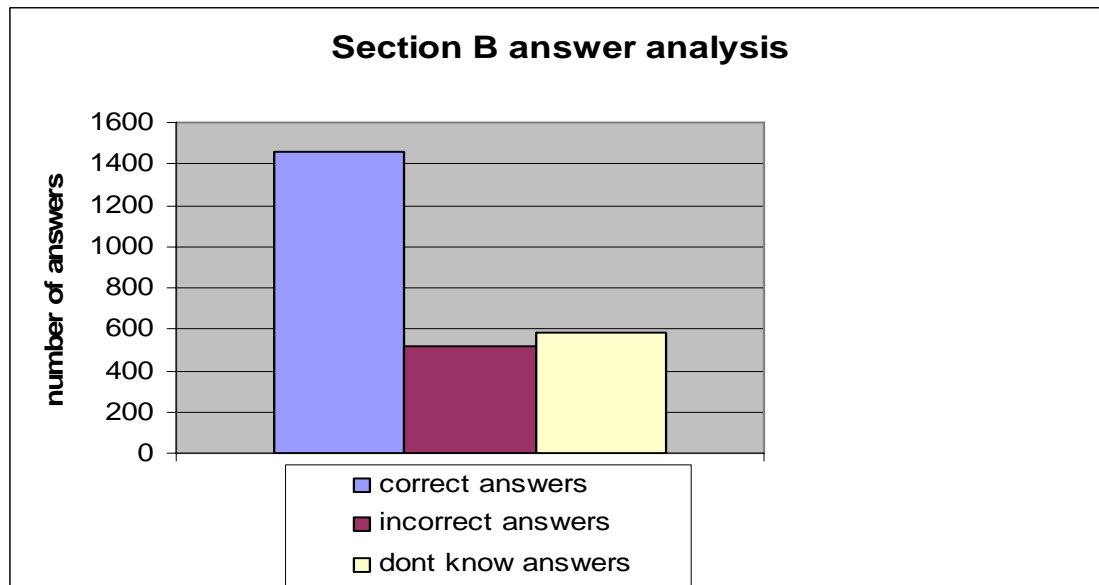


Figure seven: Section B answer analysis

Figure seven shows the majority of answers from all 142 adolescent girl participants were in the 'correct' category (1456) rather than 'incorrect' and 'don't know' categories that had similar response rates (515 and 585).

Table 8: Data analysis that indicates good knowledge levels in section B

Mean score (out of 18)	10
Median score (out of 18)	11
Mode score (out of 18)	11
Standard Deviation	2.3
Range	12
Lowest score	2
Highest score	14
Total number of correct answers	1456
Number of questionnaires	142

Table 8 shows the mean adolescent girls score was 10 questions correct out of 18 for section B. The standard deviation of the results in section B was 2.3

Table 9: Overall ‘good’ knowledge percentage for section B

Overall a ‘good’ knowledge rate was derived by working out of all the possible 2556 answers for section B (18 questions x 142 respondents). Only 1456 were answered correctly, equating to **57%** correct osteoporosis knowledge in section B. 20% (515) of questions were answered incorrectly. 23% (585) of adolescent girls responded that they did not know the answer.

Table 10: Result of section B assessment based on question cut off points (table:1)

Percentage correct answers in section B	Percentage category	Assessment based on table
57%	51-75%	Good

Table 10 shows that as the total percentage of correct answers in section B was 57%. It falls within the ‘good’ osteoporosis knowledge in this assessment.

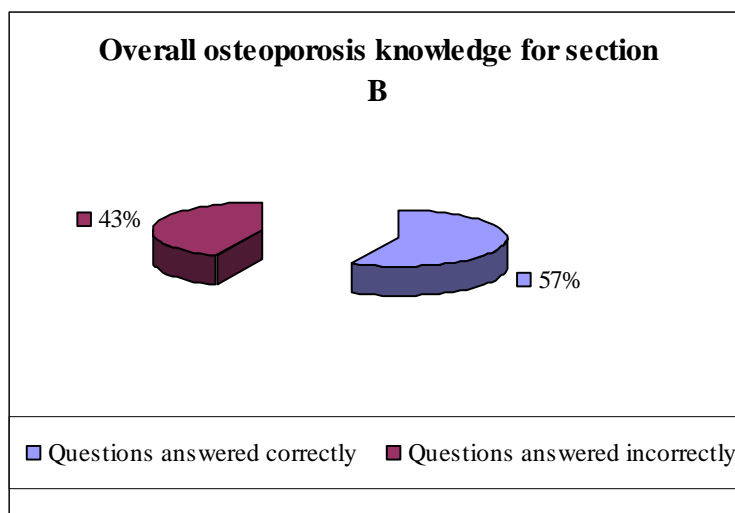


Figure eight: Dietary and physical activity knowledge for section B

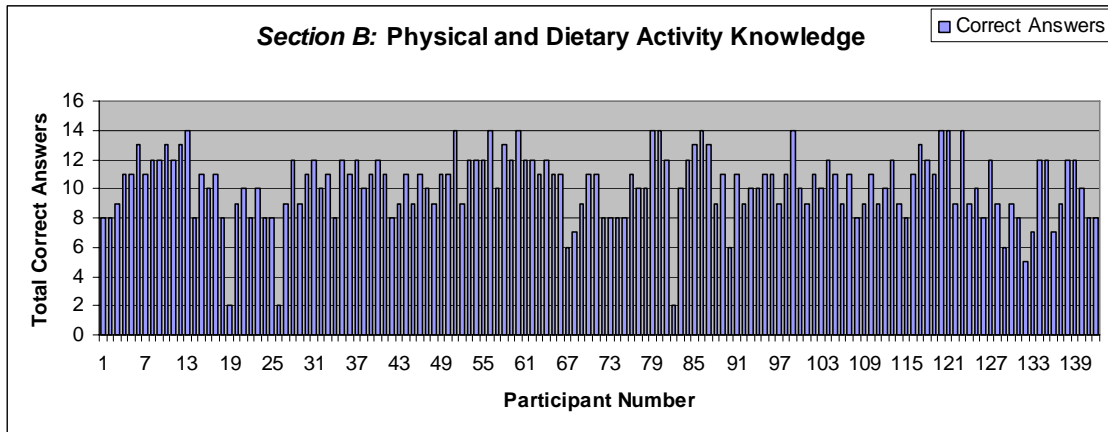


Figure nine: Individual adolescent girls correct number of responses: section B

Figure nine shows all 142 participants and the number of questions that were answered correctly in section B.

The highest number of questions answered correctly in section B was 14 and the lowest number of questions answered correctly was 2.

This is a very different pattern of success otherwise presented in figure five.

Generally there is less variations except for the three outliers which were participants: 19, 26 and 82 who only answered two correct questions.

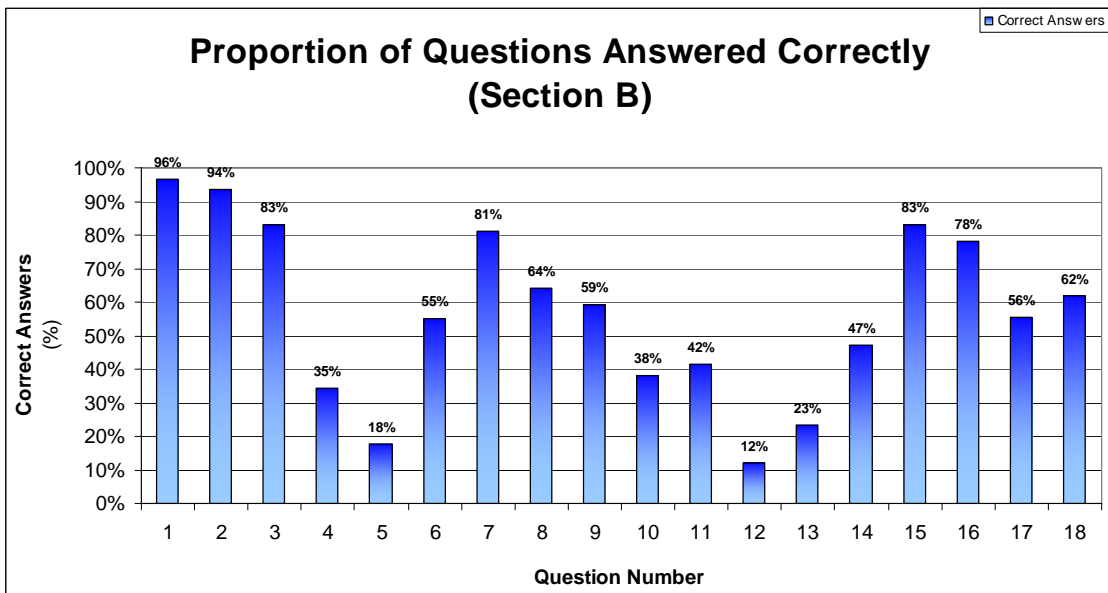


Figure ten: The proportion of students who answered each question correctly in section B. In figure ten the remaining proportion of results not shown does not simply mean that the adolescent girls answered incorrectly, they may have not recorded an answer.

Table 11: Further analysis of questions that had a particularly low correct response in section B

Question Number	Number 'correctly answered'	Number 'incorrectly answered'	Number answered as 'don't know'
4	45	76	17
5	25	29	78
12	17	26	99
13	33	68	41

Table 11 shows that the majority of these questions were answered as 'don't know'.

3.3 Results of section A and B: Osteoporosis, dietary and physical activity awareness

For section A on osteoporosis knowledge for questions one and two, 60% of girls correctly answered demonstrating a 'good' understanding that osteoporosis is more likely in women and less likely in men.

However, key contributors to osteoporosis were not recognised such as low bone density, dieting, experiencing the menopause, having ovaries surgically removed, having a low vitamin D level and the adverse effects of alcohol. These were all answered in the 'poor' understanding category.

The adolescent girls were unaware that weight-bearing exercise is beneficial to the bones. Only 21% of the adolescent girls answered this correctly, highlighting a 'poor' response.

Being underweight was another question that the adolescent girls scored poorly on; only 45% of the adolescent girls were aware that being underweight and having a low BMI could have a detrimental effect on the bones.

These factors on osteoporosis should be more specifically taught to adolescent girls. Knowing about dieting, exercise and the adverse effects of alcohol might help prevent detrimental behaviour towards the bones.

'Good' understanding of osteoporosis knowledge was found when looking at whether the adolescent girls were aware that genetic factors lead to higher risk of contracting osteoporosis. The hereditary nature of osteoporosis can be adversely influenced by the lifestyle factors chosen by the adolescent girls.

By stating that overall section A osteoporosis awareness was 'poor' 31% correct answers (on average 7 correctly answered out of 23) it is seen that there is a worrying lack of understanding and knowledge of osteoporosis. Section B however, showed that on average the adolescent girls had a 'good' dietary and physical activity knowledge and sections C and D highlighted that the adolescent girls were making favourable lifestyle choices.

In Section B on physical activity and dietary knowledge, 'poor' level of knowledge for recognising weight bearing exercise such as dancing, walking, and jogging (which are beneficial to the bones) was observed.

This section had multiple choice exercises answers such as swimming, dancing and yoga which are all good for the body, suggesting that knowledge of the fact that weight bearing exercises benefits the bones should be essential for adolescence girls to be aware of.

The most disappointing result in section B was that only 38% of adolescent girls were aware that vitamin D is mainly derived from the sun.

Vitamin D plays such an important role in the absorption of calcium on the bones and it is not encouraging to find that the girls had a poor understanding of this.

The sun as a source of vitamin D and its biological importance should be common knowledge amongst all people and ideally taught before adolescent years.

Overall for both sections A and B the adolescent girls knowledge scored 'poor' (44% total of correct answers).

3.4 Summary: The total overall percentage knowledge for both sections A and B

Table 12: Total overall percentage of correct answers for both sections A and B

Section A Correct Answer %	Section B Correct Answer %	Both Sections Correct Answer %
31%	57%	44%

Table 12 shows that the average percentage of correct answers in both sections was 44%.

Table 1 confirms the total percentage of correct answers in sections A and B (44%) falls between the 'poor' overall osteoporosis, dietary and physical activity knowledge level in this assessment.

We can therefore accept the null hypothesis that the adolescent girls have inadequate osteoporosis and related dietary and physical activity knowledge.

3.5 Section C: Current calcium and other food intake amongst adolescent girls

The aim of this section was to assess adolescent girls' dietary behaviour.

This section was covered by 4 questions. The first question provided an indication the frequency of calcium and 'other portions' (i.e. cakes, fizzy drinks...) consumption.

Question two provided an indication of whether the adolescent girls consumed breakfast cereal and took osteoporosis associated supplements.

Overview comment and observation for section C

- The calcium consumption results do not correlate with section B that highlighted 'good' calcium knowledge. The adolescent girls' calcium consumption behaviour was less than expected.

Table 13: Frequency and number of calcium containing food products consumed.

Total number of calcium portions (from the 20 examples given in the questionnaire) consumed by the 142 participants over a given period of time.	Frequency of consumption
113	2-3 times a day
360	once a day
249	4-6 times a week
492	1-3 times a week
392	2-3 times a month

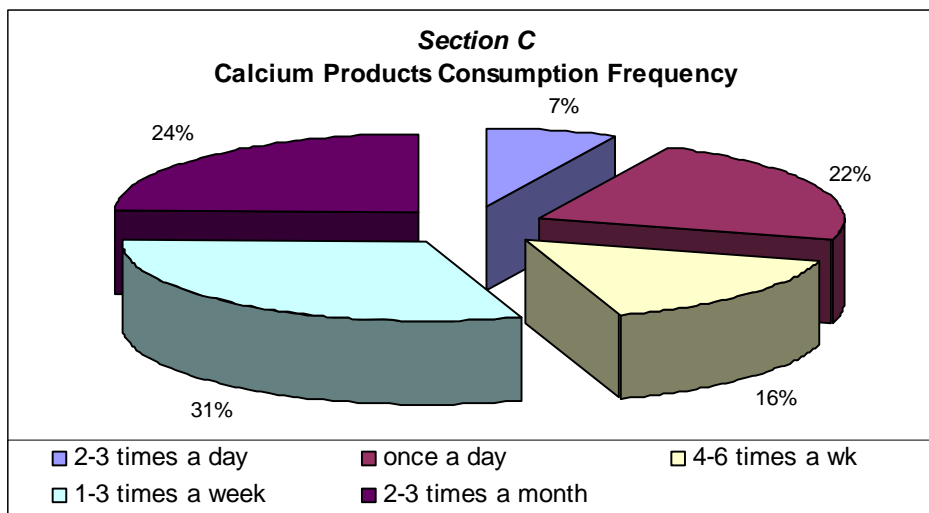


Figure eleven: Adolescent girls calcium consumption frequency

Figure eleven was derived from table 13 and shows the frequency of consumption of calcium rich foods by the adolescent girls. Most calcium consumption amongst the adolescent girls occurred around 1- 3 times a week, which consisted on average of seven to twenty one calcium containing products.

Table 14: Frequency and number of ‘other food’ products consumed

Total number of ‘other portions’ (from the 7 examples given in the questionnaire) consumed by the 142 participants over a given period of time.	Frequency of consumption
22	2-3 times a day
49	once a day
49	4-6 times a week
132	1-3 times a week
164	2-3 times a month

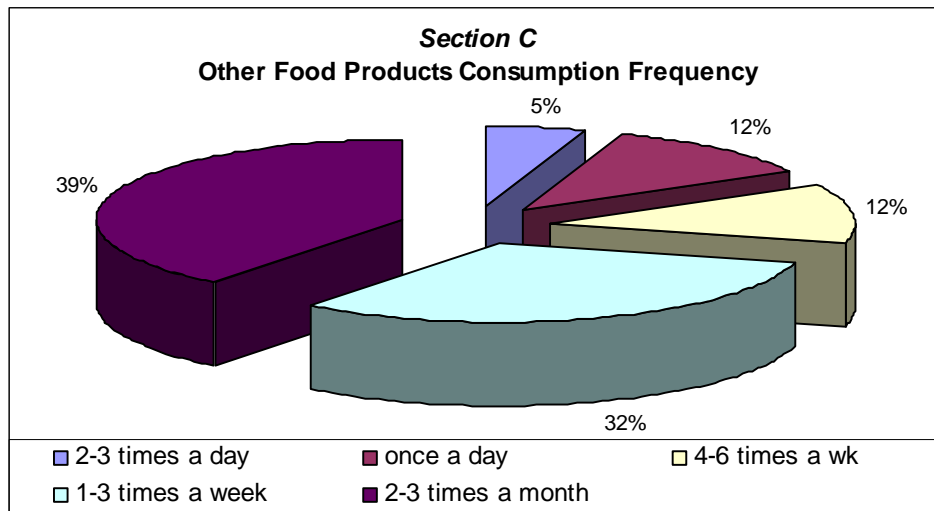


Figure twelve: Adolescent girls 'other food' consumption frequency.

Figure twelve was derived from table 14 and shows most of the 'other products' (i.e. cakes, buns, biscuits, pizza, cola and other fizzy drinks) were consumed amongst adolescent girls most frequently two to three times a month which consisted on average of three to nine 'other products'.

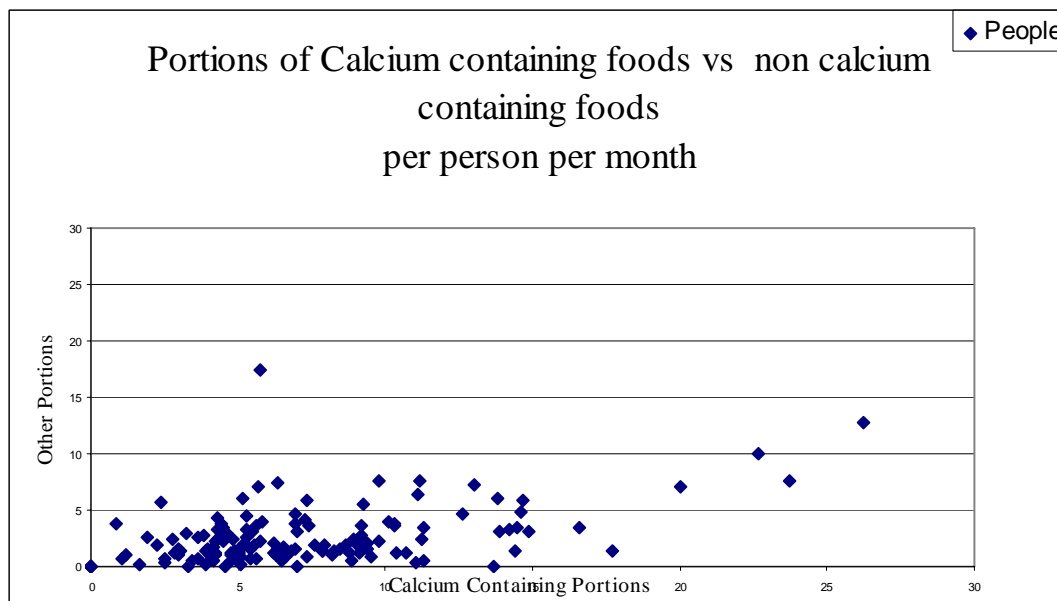


Figure thirteen: Diagram showing that most of the adolescent girls consume calcium containing products more frequently than 'other portions' of food.

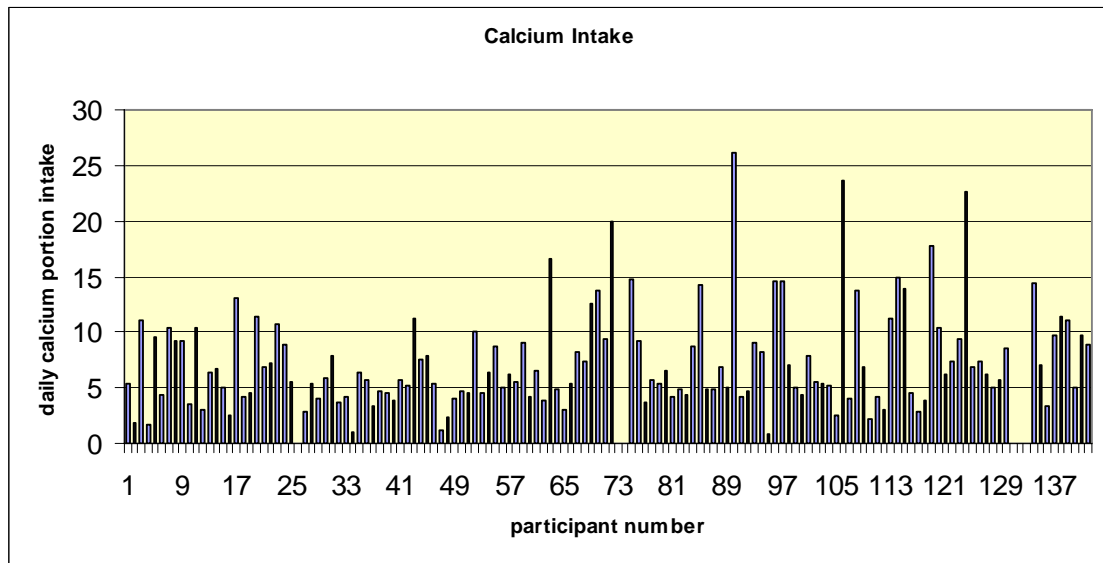


Figure fourteen: Overall adolescent girls number of portions of calcium that they consume daily. The highest daily consumption of calcium ‘portions’ was 26, which would seem questionable.

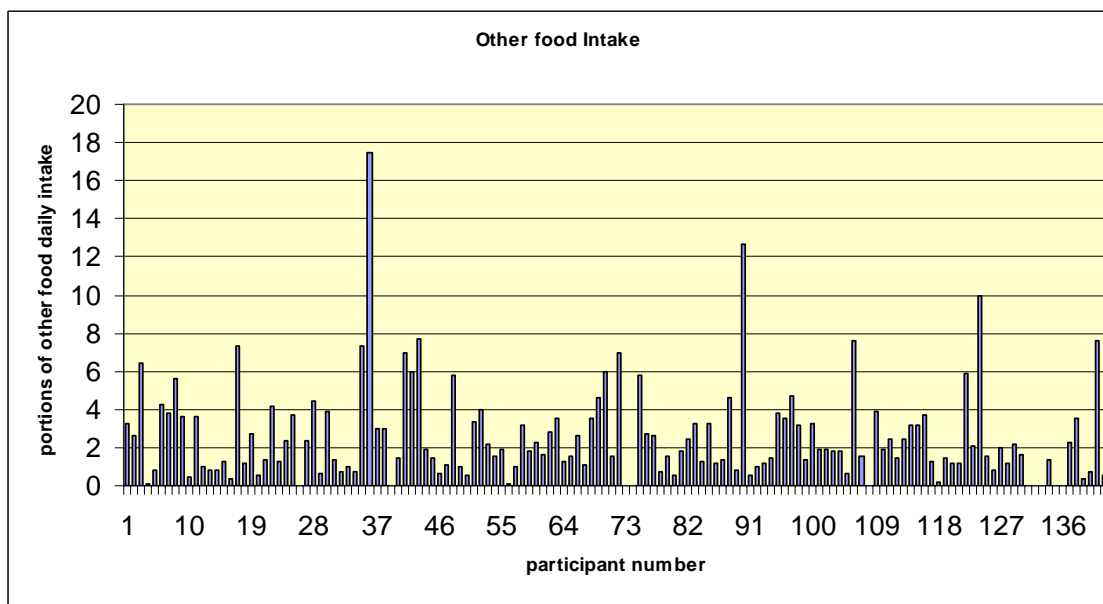


Figure fifteen: Adolescent girl’s number of ‘other portions’ of food that they consume daily. The maximum daily consumption of other portions of food was 17, which would seem questionable.

Table 15: The percentage of adolescent girls consuming breakfast cereal with milk.

<u>Breakfast</u>	<u>Number of adolescent girls consuming cereal with milk</u>	<u>% of adolescent girls consuming cereal with milk</u>
Cereal with milk	78	55% (good)

Table 16: The percentage of adolescent girls taking any kind of supplement and the percentage of adolescent girls taking a relevant type of supplement in relation to osteoporosis.

<u>Supplement being taken</u>	14% adolescent girls taking supplements
<u>Osteoporosis relevant 'type' of supplement</u>	13% adolescent girls taking supplements

In table 16 'type' relates to whether the supplement would be beneficial in the prevention of osteoporosis such as a Vitamin D or Calcium supplements.

3.6 Section D: Current physical activity, homework time and television viewing amongst adolescent girls

The aim of this section was to assess the time duration adolescent girls' participate in physical activity and home work, and television viewing.

This section was covered by five questions. The first question provided an indication of the frequency of participation in physical activity.

The other four questions provided an indication of the time spent on television viewing and home work during the week and weekend.

Overview comments and observations for section D

- The majority of the adolescent girls said they participate two to four times a week in a physical activity
- The duration of time the girls admitted to for television viewing over the week and weekend and time spent on homework over the week and weekend was one to two hours.
- The results of one to two hours spent on television viewing during the week and weekend seems questionable as it seems to be underestimated. It could be suggested that adolescents are spending more time at a computer or games consol which is not strictly television viewing.
- The results of one to two hours spent on homework during the week and weekend seems questionable as it seems to be underestimated as adolescent girls who are preparing for GCSE exams would potentially be studying more. The results were expected to be higher.

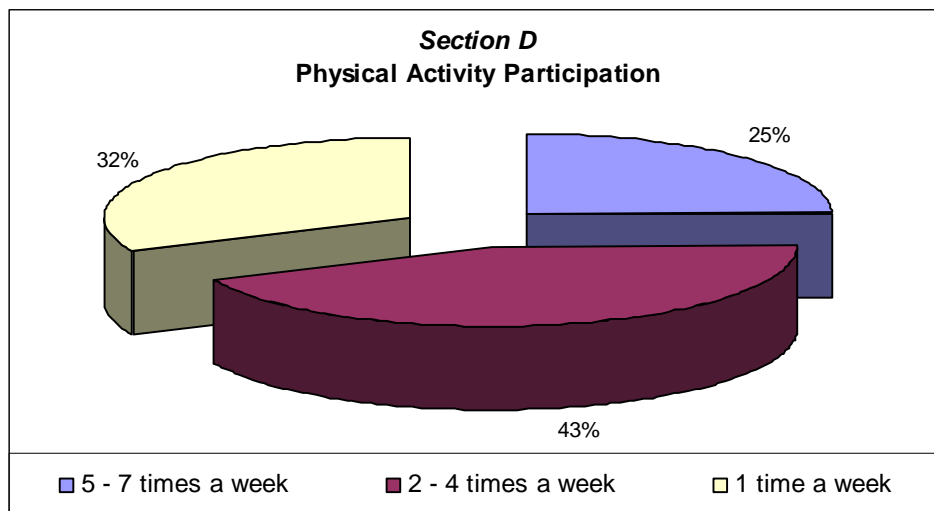


Figure sixteen: Physical activity participation
The majority of the adolescent girls said they participate two to four times a week in a physical activity.

Table 17: Average times a week adolescent girls are participating in physical activity.

Total number of 'activities' (from the 7 examples given in the questionnaire) 'participated' in by the 142 participants over given period of time.	Frequency of Physical Activity
134	5 - 7 times a week
233	2 - 4 times a week
173	1 time a week

Table 17 shows the adolescent girls were participating two to four times a week in a physical activity.

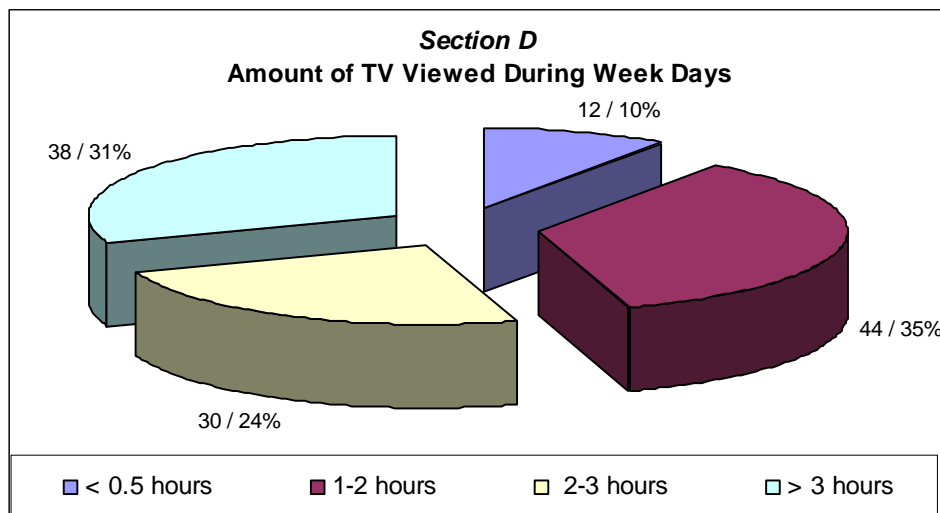


Figure seventeen: Adolescent girls' television viewing during the weekdays. Out of 122 responses for this section the majority of adolescent girls 44 (35%) admitted to only one to two hours of television viewing over the week. This result is questionable as it seems to be underestimated. Perhaps the adolescents are spending more time at a computer or games consol which is not strictly television viewing.

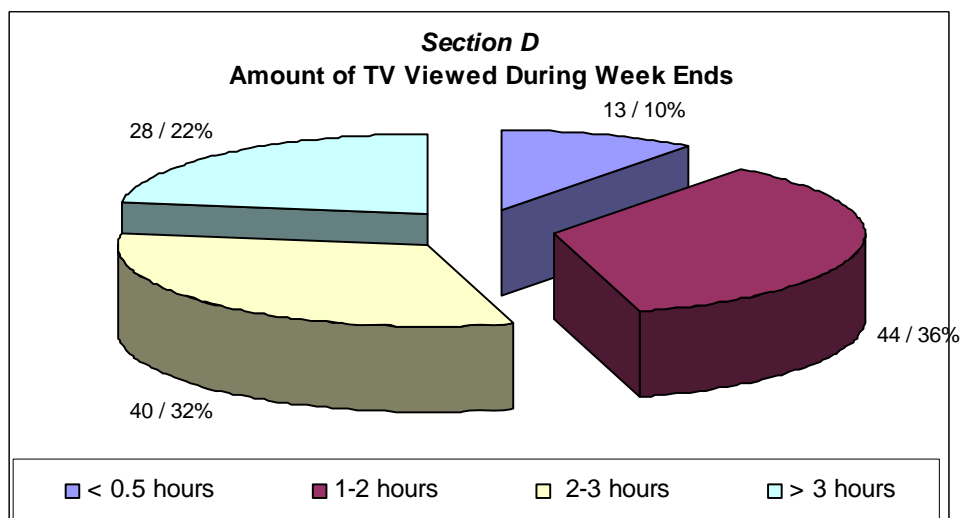


Figure eighteen: Adolescent girls' television viewing during the weekend. Out of 125 responses for this section the majority of adolescent girls 44 (36%) admitted to only one to two hours of television viewing over the week end. This is questionable as it seems to be underestimated. Again it could be suggested that adolescents are spending more time at a computer or games consol which is not strictly television viewing.

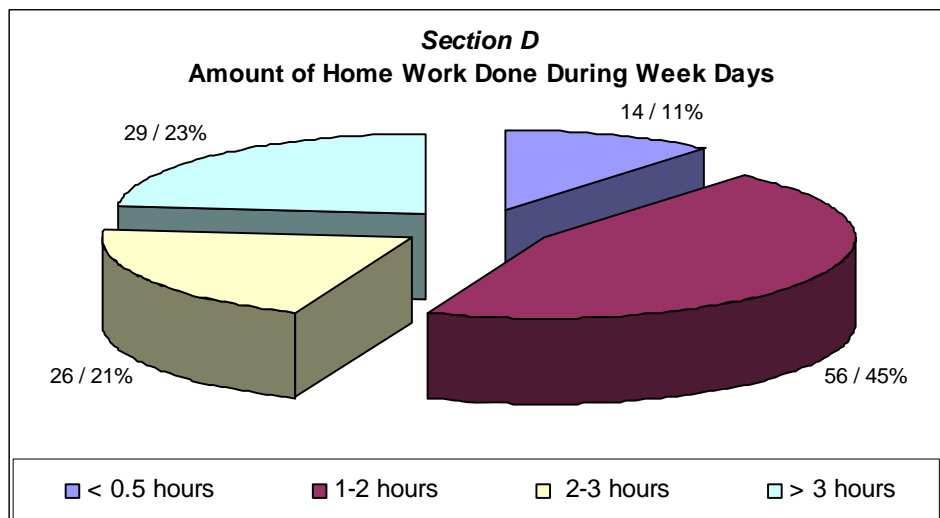


Figure nineteen: Adolescent girls' time spent on homework during weekdays. Out of 125 responses for this section the majority of adolescent girls 56 (45%) admitted to only one to two hours of time spent doing homework over the week. This result seems questionable as adolescent girls who are preparing for GCSE exams would potentially be studying more. The results were expected to be higher.

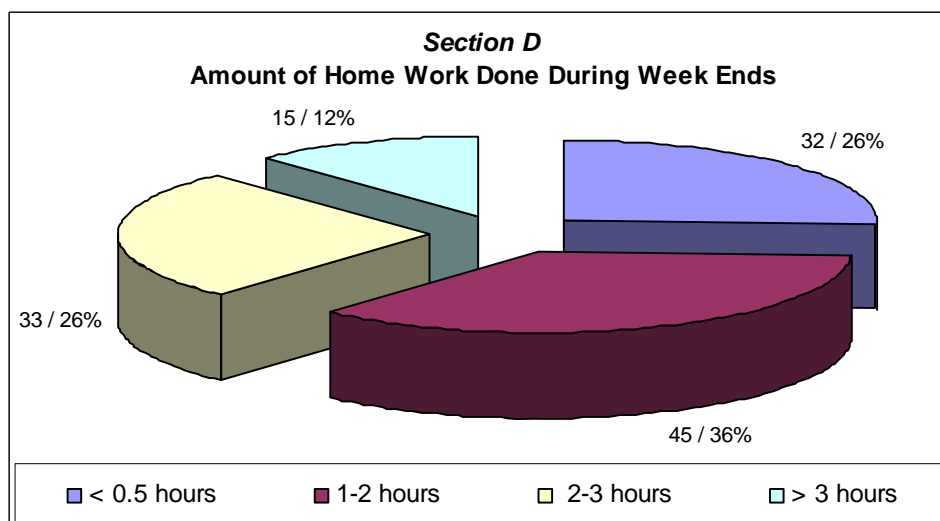


Figure twenty: Adolescent girls' time spent on homework during the weekend. Out of 125 responses for this section the majority of adolescent girls 45 (36%) admit to only one to two hours of time spent on homework over the weekend. This result seems questionable as adolescent girls who are preparing for GCSE exams would potentially be studying more. The results were expected to be higher.

Section D appears to have less credibility than the other sections as all of the television viewing and homework time were questionable.

3.7 Comments on the results in relation to the hypotheses

Adequacy of adolescent girls' knowledge of osteoporosis for the prevention of the condition.

Section A showed overall 'poor' knowledge as only 31% of questions were answered correctly. Considering that this section was based solely on osteoporosis knowledge it has raised concerns that adolescent girls are unaware of the issue in context and this supports the null hypothesis (Ho) that adolescent girls knowledge of osteoporosis is inadequate for the possible prevention of the condition.

Adequacy of adolescent girls' knowledge of dietary recommendations in relation to the prevention of osteoporosis.

Section B showed overall 'good' knowledge as 57% of questions were answered correctly. Considering that this section covered dietary recommendations it suggests that adolescent girls are aware of the issue in context and although overall the null is confirmed, section B results are encouraging and stood as "good" suggesting, adolescent girls' knowledge of dietary recommendations is adequate for the possible prevention of osteoporosis.

For the 'most foods containing calcium' section, the results produced 'excellent' knowledge - 96% of the adolescent girls were aware that cheese contained the highest amounts of calcium and 86% of adolescent girls were aware that yoghurt contained the highest amounts of calcium along with 83% of adolescent girls correctly recognising ice cream also contained the highest amounts of calcium from a multiple choice section of three food items.

There is a contrast in this section, when asked for the most non-dairy sources of calcium, out of three food choices including baked beans, sardines and spinach, all of the adolescent girls scored a 'poor' knowledge that these foods are beneficial to the calcium supply in the body.

81% of adolescent girls were aware that tofu is a good source of calcium as opposed to sausages and bacon.

The validity of this answer is uncertain as the potential alternative sources of calcium might seem to be easier than in the other multiple choices in this section. For example with Tofu, the other multiple selection choices were sausages and bacon. The participant might have taken an educated guess, assuming that a non-meat product might have been a greater source of calcium than a meat product.

Similarly cheese might have been selected against the selections of apple and cucumber for its dairy nature.

To highlight validity for these multiple choice selections, it is suggested that, by selecting such categories where the answers might be seen to be clearer it is beneficial in reinforcing the adolescent girl's dietary knowledge on calcium containing products.

'Good' knowledge on calcium guidelines were found as the adolescent girls recognised that 800-1000mg of calcium is the recommended daily amount.

Adequacy of adolescent girls' knowledge of physical activity recommendations in relation to the prevention of osteoporosis.

Although the adolescent girls scored 'poorly' on awareness to bone health, the adolescent girls were aware of physical activity recommendations.

'Excellent' correct responses were found for the frequency of exercise - 78 % correctly answered that exercise should be participated in three to five times a week

'Good' 56% correct response was found on the ideal duration of exercise being twenty to thirty minutes.

'Good' 62% correct response was found that exercising intensity ideally means that an individual's breath should be faster but the individual should still be able to talk.

'Good' knowledge of the ideal breathing rate at which the body should work at when exercising (faster but able to talk) was recognised by adolescent girls with 62% answering this correctly.

These high correct question percentages conflict with the null hypothesis and suggests that the girl's knowledge of physical activity recommendations is adequate in the prevention of osteoporosis; however as the questions were not osteoporosis specific the null hypothesis is still valid overall.

Adequacy of adolescent girls' knowledge of dietary needs and physical activity recommendations in relation to the prevention of osteoporosis.

Section B, which focused on dietary needs and physical activity knowledge resulted in a 'good' response rate with 57% of correctly answered questions on dietary and physical activity knowledge.

The girls are aware of physical activity recommendations and overall the results conflict with the null hypothesis which suggests that adolescent girls' knowledge of dietary needs and physical activity recommendations is adequate in relation to the prevention of osteoporosis; however as the questions were not osteoporosis specific, the overall null hypothesis is still valid.

Adequacy of adolescent girls' current dietary behaviour in relation to the prevention of osteoporosis.

Section C looked at current food choices made by the adolescent girls and, found calcium consumption one to three times a week for calcium containing food, but less healthier choices such as cakes, buns, biscuits, cola and fizzy drinks were consumed less frequently at two to three times per week.

The overall average number of calcium portions consumed per week was seven.

The calcium consumption results suggest that it is unlikely the girls are getting their recommended daily 800-1000mg of calcium.

Beneficial calcium rich cereals were consumed by 55% of the adolescent girls. This is within the 'good' category and is an integral part of the adolescent girl's dietary choice but the frequency of consumption of breakfast cereal was not recorded.

Additionally, the taking of supplements was looked at in relation to osteoporosis such as a vitamin D or calcium enriched supplement but the result was 'very poor'- only 13 % of adolescent girls took a relevant osteoporosis supplement. This is only relevant if the adolescent girl's diet has an inadequate calcium intake. If the adolescent girls diet is adequate a supplement should not be needed.

The results support the null hypothesis that adolescent girl's current dietary behaviour is inadequate in relation to the prevention of osteoporosis.

Adequacy of adolescent girls' current physical activity behaviour in relation to the prevention of osteoporosis.

Section D looked at current physical activity. Mostly the adolescent girls participate in some form of physical activity two to four times a week walking for longer than 20 minutes, jogging for longer than 15 minutes, swimming, team sports both in and out of school and other extra curricular sports such as dancing.

During an average week the adolescent girls participated 12 times in a range of these activities. The results are encouraging.

The results conflict with the null hypothesis and suggest that adolescent girls current physical activity behaviour is adequate in relation to the prevention of osteoporosis; however as the questions were not osteoporosis specific and the null hypothesis is still valid overall.

Summary of adequacy of adolescent girls' overall knowledge and behaviour for diet and exercise in relation to the prevention of osteoporosis

Overall knowledge for section A and B was 'poor' 44% (lower than the 50% 'good' knowledge rate).

The adolescent girls did participate in exercise and most frequently two to four times per week.

Calcium consumption frequency was mostly one to three times per week highlighting less than the recommended 800-1000mg per day.

The above three results support the null hypothesis that adolescent girls overall osteoporosis knowledge and behaviour for diet and exercise is inadequate in relation to the prevention of osteoporosis.

3.8 Results in relation to National Osteoporosis Society recommendations (2009)

With questions in relation to National Osteoporosis Society literature (2009), the results were as follows;

1. **Healthy balanced eating**

Section A (osteoporosis knowledge);

The adolescent girls were asked about whether being anorexic had anything to do with osteoporosis. The results showed that the girls had 'good' knowledge with 59% of the adolescent girls being aware that anorexia is linked to osteoporosis (84 correct answers, 29 incorrect answers and 29 did not know).

The adolescent girls were asked about whether being on a diet had anything to do with osteoporosis. The results showed 'very poor' knowledge with only 22% correct answers linking diets to osteoporosis (31 correct answers, 72 incorrect answers 39 did not know). However, the word 'diet' is not specific and may have lead to a subjective answer.

The adolescent girls were asked about whether eating a diet high in green leafy vegetables had anything to do with osteoporosis. The results showed 'poor' knowledge with 38% of adolescent girls being aware that green leafy vegetables were beneficial to the prevention of osteoporosis (51 correct answers 47 incorrect answers 44 did not know answer)

The adolescent girls were asked about whether eating enough dairy products had anything to do with osteoporosis The results showed 'good' knowledge and 52% answered correctly (74 correct 32 incorrect and 36 did not know)

Section C (dietary intake)

The results showed that the majority of adolescent girls, 31%, consumed calcium portions, which were a single calcium rich product on average one to three times a week.

24% of the adolescent girls consumed calcium portions two to three times a month, only 22% consumed calcium portions once a day and 16 % consumed calcium portions four to six times a week. Concern is raised that unless the adolescent girls are consuming calcium from other unmentioned food sources it is doubtful that they are getting the recommended daily allowance of 800-1000mg of calcium.

The results showed that the majority of adolescent girls consumed other, less healthy choices of food most frequently, two to three times a month (39%).

32% of the adolescent girls consumed other foods one to three times a week, 12% once a day, 12% 4-6 times a week and 5% 2-3 times a day (other food products mentioned were: cakes, buns, biscuits, pizza and cola).

Although calcium portions were consumed more frequently than the less healthy foods only 55% (78) consumed a calcium rich containing breakfast.

Recommendations for healthy balanced eating

- Base meals on starchy foods but, try and make them of a whole grain variety such as brown rice and pasta.
- Eat more fruit and vegetables; at least five portions a day.
- Eat more fish. Try for two portions a week, consider that oily fish such as mackerel are good sources of vitamin D.
- Cut down on saturated fats and sugar.
- Reduce salt intake; not exceeding 0.5g per day.
- Increase activity and aim to maintain a healthy weight.
- Include breakfast as it energises the metabolism.

(All about osteoporosis, NOS, 2008)

2. Adequate calcium intake

Section A (knowledge)

The adolescent girls were asked about whether making sure they had adequate calcium intake had anything to do with osteoporosis. The results showed only 52% of adolescent girls were aware of calcium intake and osteoporosis. Although this is a 'good' result it ideally needs to be a much larger percentage, as this is a major concern for bone health. Girls being unaware of the crucial role of calcium is a worrying and this trend needs addressing.

Section C (dietary intake)

The results showed that 64% of the adolescent girls did not know the recommended daily amount of calcium for a teenage girl is around 800/1000mg per day (91 correct answers 27 incorrect and 24 did not know).

Age related recommendations for adequate calcium intake per day

0-12 months; 525mg

1-3 years; 350mg

4-6 years; 450mg

7-10 years; 550mg

11-18 years; 1,000/800 mg

19+ years; 700mg

Pregnant women; 700mg

Breast feeding women; 700mgs plus an additional 550mg

Government Nutrient Intake Recommendations

(All about osteoporosis, NOS, 2008)

3. Sun exposure and vitamin D intake

Section A (knowledge)

The adolescent girls were asked about whether having a low vitamin D intake had anything to do with osteoporosis. The results showed 'poor' knowledge and only 28% correct answers (37 correct 78 incorrect and 27 did not know).

Section C (dietary intake)

The adolescent girls were asked about this crucial source of vitamin D. The results showed that the adolescent girls had 'poor' (48%) knowledge of the benefits of sunshine in relation to vitamin D (54 correct 54 incorrect and 30 did not know).

Recommendation for sun exposure

15-20 minutes of sun exposure to the face and arms during the summer should provide you with enough vitamin D throughout the year. You can also find vitamin D in margarine; egg yolks, cod liver oil and oily fish such as herrings and sardines.

4. Stopping/not smoking

Section A (knowledge)

The adolescent girls were asked whether or not smoking had anything to do with osteoporosis.

The results showed 'poor' knowledge and only 33% recognised that smoking has a detrimental effect on bone health.

Smoking-not recommended

Smoking has an adverse effect on general health and has been shown to slow down the work of bone building cells, called osteoblasts. Smoking may also cause the earlier onset of menopause (All about osteoporosis, NOS 2008)

5. Reducing alcohol intake

Questionnaire result

Section A (knowledge)

The adolescent girls were asked whether or not drinking too much alcohol had anything to do with osteoporosis.

The results showed 'poor' knowledge, only 28% of adolescent girls were aware that alcohol consumption is linked to osteoporosis (37 correct 59 incorrect answers 46 did not know).

Alcohol- not recommended

Excessive alcohol consumption is a significant risk factor for osteoporosis and fractures. Even minor alcohol intoxication is associated with an increase in falls. Men are advised no more than four units per day and women no more than three. (All about osteoporosis, NOS 2008)

6. Participating in exercise

Section A (knowledge)

The adolescent girls were asked about whether taking adequate exercise had anything to do with osteoporosis. The results just showed 'good' knowledge with 50% of the adolescent girls being aware of the physical activity connection. (71 correct 34 incorrect answers 37 did not know)

The adolescent girls were asked about whether taking weight-bearing exercise had anything to do with osteoporosis. The results showed 'poor' knowledge and only 21% were aware of the benefits of weight bearing exercise in connection to osteoporosis. (30 correct 65 incorrect answers, 47 did not know).

Answers to these questions show a lack of knowledge on the benefits of exercise in relation to the prevention of osteoporosis.

Section D (physical activity participation during the week and weekend)

The results showed that most adolescent girls (43%) participated in physical activity two to four times a week, 32% once a week and 25% five to seven times a week.

The average frequency of physical activity was 12 times during the week.

Physical activity recommendations

The NOS recommends 20 minute physical activity five times a week for general well being and bone health.

Weight bearing exercise such as jumping and skipping is good as it adds extra impact on the bones. All weight bearing exercise is good for bone health. (All about osteoporosis, NOS, 2008)

The results showed that the most common number of television hours the girls admitted to watching was one to two hours over the week and similar at the weekend. The assumption is that this is daily viewing hours as one to two hours seems particularly low over a week/weekend. Homework hours were directly proportional to this and also found one to two hours were being spent during the week/weekend doing homework.

3.9 Result summary

The primary objective of this study, was to assess osteoporosis awareness and related behaviors amongst the adolescent teenage girls and help prevent osteoporosis occurrence in later life.

Current life style choices were assessed to address the priorities that adolescent girls place on their dietary and physical activity needs.

The results supported the null hypothesis. The total percentage of correct answers in sections A and B was 44% equating to 'poor' overall osteoporosis and related dietary and physical activity knowledge.

The null hypothesis can be accepted as this research proves that the adolescent girls have little osteoporosis knowledge in section A, however, the adolescent girls were found to have a 'good' related dietary and physical activity knowledge.

Findings reveal key individual questions in sections A and B have very low correct response rate with results as low as 0 out of 23 and 2 out of 18.

Sections C and D found adolescent girls were making slightly more encouraging lifestyle decisions in relation to osteoporosis prevention. Calcium containing products were consumed more frequently than other less healthy food choices. The majority of calcium consumed however was recorded to be one to three times during the week. This raises the issue that the adolescent girls are not achieving their recommended daily calcium consumption, which is a concern. The adolescent girls frequently participated in physical activity with moderate amounts of television viewing and similar moderate amounts of homework

Television viewing was in proportion to the time spent over the week and weekends on homework.

(Appendix F: Raw data)

Chapter four: Discussion

4.1 Adolescent awareness and the opportunity for adolescent girls to learn about osteoporosis

The results from the questionnaire show that the adolescent girls are generally aware of the benefits of a balanced diet and the role of physical activity and are making better lifestyle choices without necessarily knowing about osteoporosis which, is encouraging.

With more information we would expect even more positive lifestyle choices to be made and greater daily amounts of calcium rich portions being consumed.

This is especially interesting when compared to the various research projects mentioned in the literature review where the general consensus for these studies showed adolescent girls had a lack of understanding about osteoporosis and were making unfavourable lifestyle choices.

By rationalising the adolescent girls osteoporosis knowledge as "poor" from the outcome of the questionnaire, it is not a reflection of their general intelligence, many of them are expected to achieve very good GCSE results.

On discussion with the school headmistress about the inclusion of specific knowledge of osteoporosis in the national curriculum, the headmistress stated that healthy lifestyles choices of physical activity and dietary needs are addressed but the focus on osteoporosis specifically was limited. This was supported by the research, which found that the girls possessed a 'good' dietary and physical activity knowledge but lacked specific osteoporosis knowledge.

The results indicate that the general lack of osteoporosis knowledge is directly related to the lack of opportunity the adolescent girls have to learn specifically about osteoporosis and its possible prevention.

4.2 Significant issues raised from the questionnaire

1.How does osteoporosis knowledge link to dietary behaviour?

The percentage of correct answers in section A for osteoporosis knowledge was found to be 'poor' and the adolescent girls' calcium consumption behaviour was less than expected.

The results provide a connection in this study between osteoporosis knowledge and behaviour.

2. How does osteoporosis knowledge link to physical activity behaviour?

The percentage of correct answers in section A for osteoporosis knowledge was found to be 'poor' however the majority of the adolescent girls said they participate two to four times a week in a physical activity.

This study showed a lack of osteoporosis knowledge within the adolescent girls does not mean a lack in physical activity participation.

3.How does diet knowledge link to diet behaviour?

The percentage of correct answers in section B on dietary knowledge was found to be 'good'. The calcium consumption results do not correlate with section B that highlighted 'good' calcium knowledge. The adolescent girls' calcium consumption behaviour is less than expected. There is no proof from the study that there is a connection between dietary knowledge and dietary behaviour.

4.How does physical activity knowledge link to physical activity behaviour?

The percentage of correct answers in section B on physical activity knowledge was found to be 'good' and the majority of the adolescent girls said they participate two to four times a week in a physical activity.

The results provide a connection in this study between physical activity knowledge and behaviour.

Overall adolescent girls were generally unaware of osteoporosis but aware of dietary and physical activity knowledge and are currently doing moderate exercise and intake a moderate consumption of calcium rich food both of which must be increased to prevent the occurrence of osteoporosis in later life.

(Specific participant answers relating to significant questions addressed in the questionnaire are in appendix G)

4.3 Results in relation to previous research (supporting/conflicting evidence from section 1.12)

Current and existing research supports the need to raise awareness of osteoporosis prevention.

A structurally similar survey by Davis in 1999 focused on 16 year-old females (see section 1.12).

This study gave a mean score of 7 out of 23, which equated to 31% and 'poor', whereas results from Davis's study gave a mean score of 9 out of 24, which equated that osteoporosis knowledge amongst this adolescent age group was found to be 37.5% and 'poor'. Davis's study has the same conclusion as this research. Both highlighting that it is important to create early awareness with appropriate education and lifestyle changes to achieve peak bone mass (Davis, 1999).

This research project found very similar results to the Singapore project (see section 1.12) by Liew, (2005).

On assessment of Liew's study it would have been beneficial for this research to have given the adolescent girls a chance to give opinions on the topic both before and after the questionnaires were handed out.

The results in Singapore in 2005 found that only 29.6% of 15-20 year old females consumed adequate calcium, which echoes similar results of 22% of adolescent girls consuming calcium per day highlighted by this research.

The majority of 15-20 year old females in the Singapore study had no concern towards bone health and their knowledge of osteoporosis was limited. Although Liew's study covered a higher age range of females than this research, the outcome of both projects are similar; increasing awareness of osteoporosis and its risk factors may be essential in efforts to decrease the incidence of this disease (Liew, 2005).

Lobban (2005) looked at osteoporosis awareness and related behaviours in Dubai (see section 1.12).

This research and Lobban's research are very similar in structure but Lobban's research targeted a higher age group. The first questionnaire of twenty-one questions covered osteoporosis knowledge, risk factors and prevention. The second questionnaire covered lifestyle choices such as calcium intake, physical activity, smoking habits and alcohol as well as bone mass density scans. Both of the reports suggest low osteoporosis knowledge but subsequently the majority of subjects in Lobban's research practiced borderline high-risk behaviours relative to osteoporosis (Lobban, 2005).

In 2005 Canning studied osteoporosis knowledge, calcium intake and physical activity levels in Irish adolescent females (see section 1.12).

The results found that most participants knew the essential facts about osteoporosis, such as; the relationship between osteoporosis and being a woman, having adequate calcium intake and participating in physical activity. Section A and B of this research supports these findings and found 'good' physical activity and dietary knowledge.

Canning's research also highlighted that the girls had limited knowledge on bone health related to the benefits of vitamin D and weight bearing exercise, which was echoed in this research. Overall both research studies concluded that education of adolescents could be the first step in the prevention of osteoporosis (Canning, 2005).

Adolescent perception was also looked at by Gurney (2007) in both state maintained and private schools in Bedfordshire, UK (see section 1.12).

As this study highlights and Gurney's research supports, adolescent girls were unaware of the osteoporosis issue. Almost a third of all participants reported in Bedfordshire that they had heard or read nothing about osteoporosis.

Both studies found that adolescent girls did not appear to recognise the relationship between menstruation, menopause and the disease of osteoporosis.

Gurney's research went one step further than this study and was able to conclude that the perceived importance of osteoporosis was low amongst this adolescent age group. It was suggested that the adolescents are unlikely to make lifestyle choices, which would reduce the risk of developing the disease.

Both studies confirm and support the following: targeted education programmes are needed and should be aimed at improving knowledge as well as affecting health beliefs in a manner appropriate and appealing to these girls (Gurney, 2007).

Most recently, Rahnavard (2009), conducted research to determine adolescent girls lifestyle choices in relation to the prevention of osteoporosis (see section 1.12).

Rahnavard's research found that fifty two percent of adolescent girls did not participate in any form of physical activity and over fifty percent of the studied female's lifestyle choices were placed into the unfavourable category.

One limitation of this study was that calcium consumption was not assessed.

In support of this research we both conclude: Recognising the lifestyle choices of female adolescents could play an influential role in the prevention of osteoporosis in later years (Rahnavard, 2009).

4.4 The correlation of this research project compared to previous research

- The majority of participants are not as aware of osteoporosis and bone health as they should be.
- Osteoporosis is latent and without symptoms. This disease if not prevented through adolescence will lead to reduced bone mass and consequently to fractures, all research supports the need to raise awareness of adolescent females to change their behaviours in order to prevent the onset or deterioration of the disease.
- There is a need for more consideration on the lifestyle of these girls
- All research suggests preventing osteoporosis through raising awareness and creating positive health decisions is the best option.

All of the research mentioned highlighted authorities and decision makers should take more serious measures in the process of investigating and planning the lifestyle of this young generation.

4.5 Changing adolescent behaviours and lifestyle choices

Having identified a very worrying truth, that there is a lack of osteoporosis awareness it is now crucial to decide, as a society, what we are going to do about it.

Pressure needs to be placed across society and essentially in schools in order to get the message of essential bone health to the target group.

The National Osteoporosis Society focuses on similar education for school, family and community environments.

Public health and promotion (Naidoo, 2005) suggests the main approaches to changing individuals behaviour are through providing information and addressing factors enabling healthier choices. This public health promotion is both crucial and essential for changing adolescent behaviours and addressing their lifestyle choices in relation to osteoporosis and general well being.

In the UK as previously highlighted, a government backed campaign was set up-the 'Naturally Beautiful Campaign' by the Milk Development Council (MDC) which urged adolescent females to eat more dairy products and, in a multi million pound initiative was aimed at defusing an onset of osteoporosis for later life (Maguire, 2005).

Calcium guidelines could be advertised in a more appealing way to adolescent girls. Within the past few years yoghurt products such as 'Petti Filous' have been marketed to children with a bone picture highlighting the calcium benefits of the product.

A project 'healthy lifestyle in Europe by nutrition in adolescence' (HELENA) was set up which incorporated all the key preventative factors for osteoporosis prevention. From 2002 -2007 a Healthy Lifestyle survey was conducted in Europe by focusing on Nutrition in Adolescence. It looked at dietary intake, nutritional knowledge, eating and attitudes, food choices, preferences of physical activity and fitness to achieved goals of understanding whilst effectively enhancing nutritional lifestyle habits of adolescents in Europe. (Retrieved from www.helenastudy.com)

More recently children's international television programs such as 'Lazy town' has proven to be very popular. This BBC broadcasted cartoon /interactive live character has come across to the UK from Iceland. It is currently (Summer 2009) touring the UK with key characters such as 'Sporticus' who loves exercise and gets his fuel from sports candy (which is healthy food). The key messages that come across influence children from as young as 3 who may be encouraged into a more active lifestyle.

High profile future events such as the 2012 Olympics encouraging adolescent girls to show an interesting in physical activity and fitness.

4.6 Prevention is better than cure

Recent articles such as ‘I really worry about my bones’ focused on a man, Robert Rees, having osteoporosis, and how his young daughter, Lauren, is concerned about bone health (Elliot, 2009).

A National Osteoporosis Society survey found that out of 2615 young people almost half did not know how to protect their bones and this launched a website called ‘bones for life’ in order to help rectify this problem. In a third of the responses, children didn’t know that diet can play a part in preventing osteoporosis.



This ‘bones for life’ website is aimed at 7-10 year olds and is an ideal way of publicising the issue for current generations.

It has two sections; one aimed at children and one aimed at adults.

In the children’s section it is an innovative brightly coloured website with a game, fun educational quizzes and even a gallery for osteoporosis related art work.

Three cartoon characters including ‘Blaze’ who loves the sun and highlights how the sun is vital for vitamin D and how it enables the body to produce vitamin D.

‘Munch’ loves healthy eating and calcium rich foods and ‘Sneakers’ who loves exercise and, in particular, weight bearing exercise all emphasise the three important factors to good bone health and are integral to the website.

The adult section is aimed at parents and teachers and has a variety of resources, power points for use in assemblies, lesson plans and family activities, as well as free school resource packs for Key Stage two. It also provides music for use in presentations, dance plans and some fundraising ideas. This website is effective and well designed to engage the child’s interest and enhances their knowledge in a light and informative way. If the key osteoporosis messages are highlighted at this young age it provides a good basis of knowledge and understanding for adolescent years and beyond for osteoporosis prevention.

With prevention being better than cure new medical advances such as the latest hormone injections, which promise better bone health, should not be so necessary.

(see appendix H for a medical advances article)

4.7 Osteoporosis and education

Gurney, (2007) supports the results of this study, demonstrating that schools are not being effective in raising osteoporosis awareness. Targeted education programs are needed and should be aimed at improving osteoporosis knowledge and affecting health beliefs in a manner appropriate and appealing to these girls.

This research proved success of the schools education on dietary and physical activity recommendations. Through no fault of the school, there was a lack of resource literature on osteoporosis such as leaflets/pamphlets.

During this study leaflets were handed out on behalf of the National Osteoporosis Society once the participants had completed the questionnaire.

In England and Wales future educational programmes are encouraging.

4.8 National Osteoporosis Society-Positive ongoing educational projects

August (2009) Lesley Millard, (**Education Officer at the National Osteoporosis Society**)
gave the following information to the author on osteoporosis and education;

The National Curriculum in England (different in each country of the UK)

In Key Stage 2, 8/9 year olds are taught about the skeleton and movement. Personal, Social, Health Citizenship and Education (PSHCE) covers healthy lifestyles across primary range, PE- Healthy Lifestyles, Design and Technology (in which balanced diets is taught). Key Stage 3 / 4 PSHCE covers Personal Well-being, Science- Organisms, behavior and health, PE which covers Healthy Lifestyles, Design and Technology (in which making food and include essentials on balanced diets is taught). There is no direct reference to osteoporosis but there is general coverage of the body, diet, exercise and healthy lifestyle.

Other forms of teaching about osteoporosis occur where groups and volunteers are located and have been going into schools. This is not consistent across the UK and mostly feature in primary not secondary schools.

With regards to secondary education for adolescents the National Osteoporosis Society is now working to develop materials to support the teaching of bone health at secondary level.

Recently three secondary schools in Cornwall have been working with the Prince's Trust- Integrated Health – and now have health centres in each school. The National Osteoporosis Society is hoping to work with them to create some resources for secondary schools but this is in the infancy stage at the moment.

The National Osteoporosis Society has also been approached by Team Bath (Sports Development based at the Bath University, UK) with regard to working together in schools.

All the National Osteoporosis Society projects are very exciting in raising osteoporosis awareness amongst adolescent girls although they are in their infancy.

Juliette BROWN (NOS. Public Affairs & Policy Manager) stated that the National Osteoporosis Society will be largely focusing on secondary education in 2010.

When looking at the Edexcel syllabus for Advanced GCSE in Health and Social Care (Teachers guide) concerns were raised that there was only a small paragraph mentioning osteoporosis: 'Osteoporosis a disorder that results in the reduction of bone tissue causing brittle bone most often seen in the elderly'.

It would be better if it recommended 'preventative measures can be taken when in adolescence years of adequate lifestyle choices and dietary habits plus the absorption of vitamin D' (edexcel.org.uk).

A Health and Social Care GCSE could incorporate osteoporosis.

Edexcel Advanced Subsidiary in Physical Education, Final examination paper for Health lifestyle Health fitness and exercise, did mention under 'Differences/Links to positive health benefits' (physical and physiological) under 'Physical' reducing the risk of osteoporosis and osteoporosis under 'effects of aging'. More could be mentioned on osteoporosis but at least osteoporosis is in the syllabus (edexcel.org).

4.9 Research Limitations

- A research limitation was that adolescent girls perceptions of osteoporosis and their opinions on all dairy products were not addressed. The Milk Development Council (MDC) found that adolescent girls were consuming less dairy products than other sex/age categories.
- A research limitation was that there was no focus on the media/images that adolescent girls are influenced by. The MDC study shows that adolescent girls are constantly wanting to achieve or maintain a smaller frame via dieting, cutting out calcium and alarmingly prioritise this over future bone health.
- The study found limitations in section D on the total amount of time spent on physical activity. Hours/time spent on physical activity would have been better to assess rather than just an average number of times per week.
- In section D currently adolescents may be spending a lot of time talking their friends on the telephone, playing games consoles and spending time on computers which is not strictly television viewing and was not related to in the questionnaire. It would have been better to include these variables and focus on inactivity rather than just television and homework time and make clearer the daily time duration. The results were deemed unnecessary to discuss in great detail.
- Ideally, a larger scale study involving more schools would have provided a more comprehensive data set to base conclusions on. However, there is a strong correlation between this study and others carried out in a number of countries and it may be seen as a confirmatory study indicating the need for enhanced awareness of osteoporosis in adolescent girls.

4.10 Future recommendations for further study

- English National Ballet now works with osteocare (UKs leading calcium supplement). They research the importance of calcium rich products for bones placed with high physical demands due to dietary restrictions and intense exercise (www.ballet.org.uk). A focus on eating disorders and bone health amongst adolescents is an interesting topic as osteoporosis occurrence is high amongst female ballerinas.
- A longitudinal study could be conducted to analyse adolescents lifestyles in relation to osteoporosis prevention and the occurrence of osteoporosis after menopausal age.
- Assessment could have been made on how many adolescents eat a family meal at least once a day and what the adolescent females school dinners consist of. Whether there has been a historical dietary change, which meant an inclusion/exclusion of some calcium containing food products from adolescent diets would be interesting to look at.
- An interesting further study could look into the history of bone disease to assess whether our ancestors suffered from osteoporosis and assess their dietary and physical activity behaviour and how it would greatly differ from today.
- A future study could look into the developing world and occurrence of osteoporosis in relation to their dietary and physical activity behaviour and how it would greatly differ from the western world.
- A key question that could be looked at in future research would be: What is the perceived level of importance from adolescent girls for preventing osteoporosis for later life?
- A world study of different countries and diets and physical activity relating to the occurrence of osteoporosis would also make an interesting study. Fast food nations such as America could be focused upon.

Chapter five: Conclusion; collective responsibility

5.1 A collective responsibly to raise osteoporosis awareness

It is a collective responsibility, based not solely on the individual, to increase their knowledge and improve the quality of their life, but for us all to help raise the awareness of osteoporosis and spread the benefits that a healthy life style including plenty of water, calcium, fruit, vegetables, sunshine and exercise can bring.

For many people, there is a misconception that osteoporosis is a disease prevalent in the elderly. The author held a similar misconception before this research. It has been assumed that osteoporosis was part of the aging process. There has been a general unawareness that osteoporosis was a preventable disease or that its onset could be reduced or the effects reduced.

Other debilitating diseases that negatively affect the quality of an individual's life such as heart disease and forms of cancer are heavily publicised. Osteoporosis needs the dedication of organisations such as the National Osteoporosis Society to continue to raise awareness, which is beneficial for all individuals in society.

This survey highlighted the lack in knowledge and understanding of osteoporosis within the adolescent age group, but in fact there is a lack of awareness amongst all age groups and both sexes. The NHS and the Department of Health and Social Security could be doing more to help raise the awareness of osteoporosis.

The key finding of this research was that there is a need to raise awareness of osteoporosis and the role education plays is vital in doing this. Targeted education programmes are needed and should be aimed at improving knowledge as well as affecting health beliefs in a manner appropriate and appealing to adolescent girls. Osteoporosis does not feature highly enough in the National Curriculum. Measures that could be taken by means of a wider national campaign such as a reintroduction of calcium containing foods for schools would

be beneficial to raise the profile of osteoporosis and help adolescent girls become increasingly aware.

The National Osteoporosis Society's work is essential for, the prevention of this disease. The NOS states the charity's vision for 2009-2013 is a 'future without fragility fractures'.

It is their mission to improve public awareness and understanding of osteoporosis, influence health and social care provision and achieve excellence in the prevention, diagnosis and treatment of osteoporosis to prevent fragility fractures.

With all new web sites aimed at educating the younger generation using visual aids on osteoporosis, bullet points and catch phrases with identifiable cartoon figures awareness of osteoporosis will hopefully increase in the foreseeable future.

An annual go "orange for osteoporosis day" as well as using younger famous figures in the media, able to speak first hand and support the charity, will target prevention of osteoporosis rather than cure.

The research has provided evidence for the author to change her own professional practice.

The author contacted a local MP on the 27th August 2009 (see appendix I for MP contact) to raise osteoporosis awareness.

The author is actively raising awareness amongst the Girl Guides Association to help the National Osteoporosis Society on the ongoing mission to prevent the onset of osteoporosis for future generations.

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Images

Front cover: Osteoporosis affected bone:www.faqs.org/health/images

Figure one: Osteoporosis visual:www.osteopathy.com

Figure two:

The affect of Vitamin D on calcium absorption in the bones:www.calciumeveryday

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Chapter 3:34-50, Chapter 4:53-66, Chapter 5:72-85 & Chapter 6:88-103.

Appendix A: Kingdown School permission for research

6.

8 Upper Whatcombe
Frome
Somerset
BA11 3SA
31st March 2009

Dear Mrs Brown

Firstly I would like to thank you for helping make not just my own but my family and friends school life such a pleasant experience filled with lots of happy memories- Kingdown is a fantastic school, well done.

Since leaving Kingdown I have an Environmental Science degree and work locally at a hazardous Waste Transfer Station which is brilliant.

I am also studying Osteoporosis which is where I wondered whether you could help.

Osteoporosis literally means 'porous bone' and one in two women and one in five men over the age of 50 will break a bone, mainly due to Osteoporosis. Although our genes are key to deciding the potential size and strength of our skeleton, life choices play a part in the amount of bone we invest in our 'bone bank' during youth. By preventing porous bones through healthy balanced eating and physical activity play major roles in reducing the occurrence of Osteoporosis in later life.

I would like to give an anonymous 5-10 minute questionnaire to 200 teenage girls aging 12-16 and to assess their Osteoporosis awareness and dietary and physical activity intake. After completion of the questionnaire there is a pamphlet of approved literature from the National Osteoporosis Society on Osteoporosis with facts and preventative information for the girls to keep.

Would this be at all possible? I enclose the questionnaire, pamphlet and a consent form.

I have an in date CRB check from being an assistant guide leader- disclosure number 001165599520.

If you can help, please could you write a brief letter addressed to me just saying it would be okay to hand out a questionnaire at Kingdown.

Many thanks

Debbie Kerfoot – Savin (27)
Tel: 01373 300 789

Ex. Kingdown Pupil 1994-2000



University of Chester

Emailed conformation with Kingdown School Warminster that Debbie Kerfoot-Savin can conduct research.

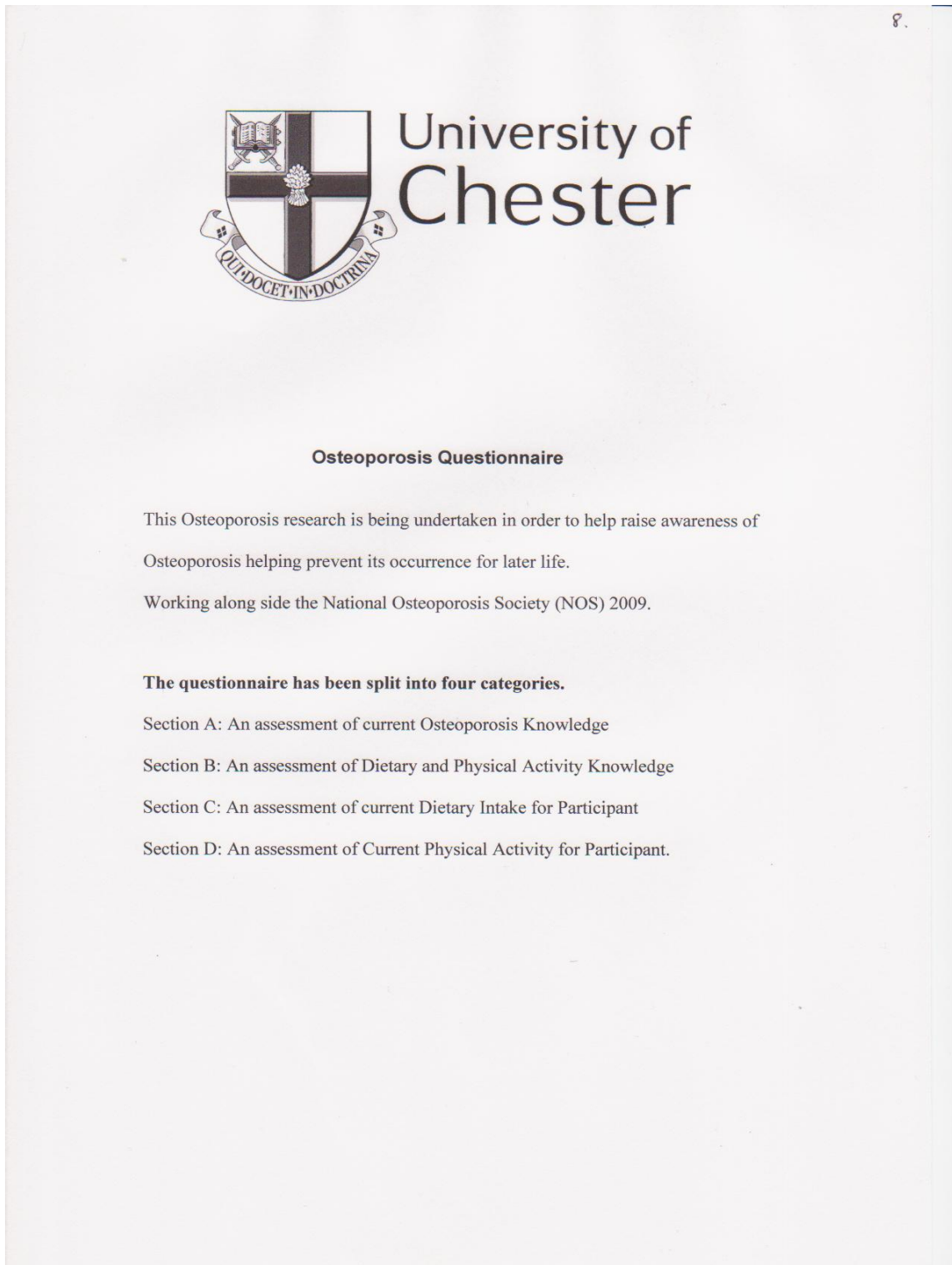
From: Joan Biancoli (JMB@kingdown.wilts.sch.uk)
Sent: 02 April 2009 12:55:06
To: Debs Kerfoot (debspepper@hotmail.com)
Debbie

Mrs. Brown is very happy to do this for you. Please can you let her have the relevant paper work so that she can arrange for it to be done during a Tutor Time slot after Easter. We return on 20th April.

Many thanks

Joan Biancoli

Appendix B: Questionnaire



Section A : Osteoporosis Knowledge Questionnaire:

Please indicate whether you think the following factors would make you

- ‘more likely’ to get osteoporosis
- ‘less likely’ to get osteoporosis
- ‘have nothing to do with’ getting osteoporosis

If you do not know an answer, please answer ‘don’t know’.

Please try not to guess an answer. This is not a test and it does not matter if you do not know an answer.

1. Being a woman

More likely	Less likely	Nothing to do with	Don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. Being a man

More likely	Less likely	Nothing to do with	Don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. Being white

More likely	Less likely	Nothing to do with	Don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. Being Asian

More likely	Less likely	Nothing to do with	Don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Having a mother with osteoporosis

More likely Less likely Nothing to do with Don't know

6. Having a mother not as tall as she used to be

More likely Less likely Nothing to do with Don't know

7. Being overweight

More likely Less likely Nothing to do with Don't know

8. Being underweight

More likely Less likely Nothing to do with Don't know

9. Having big bones

More likely Less likely Nothing to do with Don't know

10. Being anorexic

More likely Less likely Nothing to do with Don't know

11. Being on a diet

More likely Less likely Nothing to do with Don't know

12. Making sure you have adequate calcium intake

More likely Less likely Nothing to do with Don't know

13. Eating a diet high in green leafy vegetables

More likely Less likely Nothing to do with Don't know

14. Eating enough dairy products

More likely Less likely Nothing to do with Don't know

15. Having a low vitamin D intake

More likely Less likely Nothing to do with Don't know

16. Having a low vitamin A intake

More likely Less likely Nothing to do with Don't know

17. Taking adequate exercise

More likely	Less likely	Nothing to do with	Don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

18. Taking weight bearing exercise

More likely	Less likely	Nothing to do with	Don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

19. Not drinking too much alcohol

More likely	Less likely	Nothing to do with	Don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

20. Not smoking

More likely	Less likely	Nothing to do with	Don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

21. Going through the menopause

More likely	Less likely	Nothing to do with	Don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

22. Having your ovaries surgically removed

More likely	Less likely	Nothing to do with	Don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23. Having good posture

More likely	Less likely	Nothing to do with	Don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Section B : Dietary and physical activity knowledge:

1. Please tick the food in each group that provides the most calcium:

- | | | |
|--------------------------|--------------------------|--------------------------|
| a) Cheese | Cucumber | Apple |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Yoghurt | Grapefruit | Cabbage |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c) Ice-cream | Grapefruit | Tomatoes |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d) Chicken | Grapes | Baked beans |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e) Corn | Potatoes | Tinned sardines |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f) Spinach | Carrots | Mushrooms |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| g) Tofu | Bacon | Sausages |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

2. What is the recommended daily amount of calcium for a teenage girl in Ireland?

- | | | |
|--------------------------|--------------------------|--------------------------|
| 600 - 800mg | 800-1000mg | 1000+ mg |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

3. How many half pint glasses of milk/day would you need to get enough calcium?

- | | | |
|--------------------------|--------------------------|--------------------------|
| 1-2 | 3-4 | 5+ |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

4. Apart from food sources and supplements, where else can you get vitamin D?

5. Please tick the exercise in each group which is best for healthy bones

a) Jogging Cycling Horse-riding

b) Dancing Yoga Swimming

c) Waterpolo Football Cycling

d) Walking Rowing Lifting weights

e) Snooker Basketball Skateboarding

6. How many days per week should you exercise for general health?

Once 3-5 times 6-8 times

7. How long should you exercise for?

< 15 mins 20-30 mins >60 mins

8. How should your breathing be during exercise?

a little faster much faster but able to talk much faster but unable to talk

Section C : Dietary intake:

1. Please indicate how many times in the past month you have eaten/drunk the following foods?

Food	Portion	2-3 times/ day	Once a Day	4-6 times/ week	1-3 times/ week	2-3 times/ month	Never
Whole milk	½ Pint						
Skim milk	½ Pint						
Semi-skim	½ Pint						
Goats milk	½ Pint						
Soy milk	½ Pint						
Hard cheese Eg.cheddar	Matchbox sized						
Soft cheese Eg. Philadelphia	Table spoon						
Yoghurt	Pot						
Actimel	Bottle						
Block ice-cream	Slice						
Icecream Eg. Choc-ice	1						
Spinach	Large spoon						
Broccoli	Large spoon						
Tinned salmon	Small tin						
Tinned sardines	½ Tin						
Eggs	Medium						

Food	Portion	2-3 times/day	Once a Day	4-6 times/week	1-3 times/week	2-3 times/month	Never
Breakfast Cereal	Bowl						
White Bread	1 Slice or 1 Roll						
Wholemeal Bread	1 Slice or 1 Roll						
Brown Bread	2 Slices						
Cake	1 Slice						
Buns	1						
Biscuits	2						
Frozen Pizza Small	1						
Frozen Pizza Large	½						
Cola	1 Can						
Other Fizzy Drink	1 Can						

2. What type of breakfast cereal do you usually eat?

3. Do you take a dietary supplement (multivitamin, vitamin C etc)?

Yes

No

4. If yes, what type of supplement do you take?

Section D : Physical activity:

1. How many times in the past 7 days have you taken part in the following activities?

Activity	5-7 times	2-4 Times	Once	Never
Walking for > 20 minutes				
Jogging/running for > 15 minutes				
Swimming				
Team Sport in school				
Team sport outside school				
Other sport outside school				
Dancing				

2. On average, how many hours per day do you watch television during the week?

< ½ hour 1-2 hours 2-3 hours > 3 hours

3. On average, how many hours per day do you watch television at the weekend?

< ½ hour 1-2 hours 2-3 hours > 3 hours

4. On average, how many hours per day do you spend doing homework during the week?

< ½ hour 1-2 hours 2-3 hours > 3 hours

5. On average, how many hours per day do you spend doing homework at the weekend?

< ½ hour 1-2 hours 2-3 hours > 3 hours

Appendix C: Questionnaire standardised instructions

- Osteoporosis is a condition where bones become brittle and break easily.
- The questionnaire given contains 4 sections.
- Section A gives a list of osteoporosis risk factors, answer whether the risk factor makes a person 'more likely', 'less likely' or 'have nothing to do with' getting osteoporosis. There is also a 'don't know' option.
- This is not a test, if you do know an answer, try not to guess. It is better to answer 'don't know' rather than guessing.
- Section B contains questions about calcium and exercise. Choose from 3 possible answers, the foods that contain the most calcium and the exercises that are best for healthy bones.
- Section C is a food frequency questionnaire. Tick how often in the past month, you have eaten the foods listed. Each food has a portion size beside it.
- Section D asks how often you have participated in certain physical activities in the past week.
- Please do not ask questions of other participants.
- If you have any questions, please direct them to the researcher.
- This questionnaire is completely anonymous so you don't have to put your name down.
- You do not have to take part in this study and there will be no consequence if you choose not to.

Appendix D: National Osteoporosis Society correspondence

10.

3 Feb 2009 13:01:52 +0000
From: J.Brown2@nos.org.uk
To: debspepper@hotmail.com
Hi Debbie,

Thank you for your email and interest in osteoporosis. You are welcome to come and see us to gain some more knowledge and I'm sure we can talk about ways you can help.

Let me know some dates which are suitable, plus a bit more about what you're particularly interested in, and I'll try and co-ordinate some people to speak to.

Best wishes,

Juliette

Juliette Brown

Public Affairs & Policy Manager



National Osteoporosis Society Emailed Evidence of Contact

31 March 2009 12:45:56

Hi Debs,

Juliette Brown has asked me to contact you as I missed your visit to the charity recently. I have taken a look at your research questionnaire and it looks really interesting. I would love to hear the results when you have analysed them. It is always good to hear that someone is taking an interest in osteoporosis and any new research is welcome. Please don't hesitate to contact me if you need any further help.

Regards,

Lesley

Lesley Millard
Education Officer

Direct line: 01761 473126 Mobile: 07595 202117

National Osteoporosis Society
Camerton
Bath
BA2 0PJ

Subject: RE: Osteoporosis education
Date: Fri, 28 Aug 2009 11:55:16 +0100
From: J.Brown2@nos.org.uk
To: debspepper@hotmail.com
CC: L.Millard@nos.org.uk

Hi Debbie,
Thanks for your email and well done for getting such a good response to your research.
We are focusing on secondary education in 2010.
Thanks
Juliette

Juliette Brown
Public Affairs & Policy Manager
National Osteoporosis Society

Subject: RE: Osteoporosis education
Date: Thu, 27 Aug 2009 10:36:04 +0100
From: L.Millard@nos.org.uk
To: debspepper@hotmail.com

Hi Debs,
Glad the research is going well. In answer to your questions:

1. National Curriculum in **England Key Stage 2** (8/9 year olds) have to know about the skeleton, movement. PSHE -Personal, Social, Health Education- healthy lifestyles across primary range, PE- Healthy Lifestyles, Design and Technology- balanced diet **Key Stage 3 / 4** PSHE- Personal Well-being, Science- Organisms, behaviour and health, PE- Healthy Lifestyles, Design and Technology- making food should include balanced diet,
There is no direct reference to osteoporosis but there is general coverage of the body, diet, exercise and healthy lifestyle. All part of our key messages.
2. Other form of teaching about osteoporosis- only where groups and volunteers have been going into schools. This is patchy across the UK and mostly in primary schools. I recently heard that Edexcel did have Osteoporosis as part of their GCSE coursework but I don't know of any other work.
3. Secondary education- we are now working to develop materials to support the teaching of bone health at secondary level. I have come across 3 secondary schools in Cornwall who have been working with the Prince's Trust- Integrated Health – and have now got health centres in each school. I am hoping to work with them to create some resources for secondary schools but it is in its infancy at the moment. We have also been approached by TeamBath (Sports Development based at the University) with regard to working together in schools.

Regards,
Lesley
Lesley Millard
Education Officer
National Osteoporosis Society
Camerton
Bath
BA2 0PJ
Switchboard: 0845 130 30 76 or +44 (0)1761 471771
Fax: +44 (0)1761 471104
Helpline: 0845 450 0230 or +44 (0) 1761 472721
Website: www.nos.org.uk; www.bones4life.org

National Osteoporosis Society is a registered charity No.1102712 in England

Appendix E: Ethical approval for research

Debbie Kerfoot Savin
Centre for Exercise & Nutrition Science
University of Chester
Parkgate Road
CH1 4BJ

25 July 2009

Dear Debbie

Study title: Knowledge , attitudes and behaviour towards Osteoporosis amongst adolescent girls.

FREC reference: 314/09/DK/CENS

Thank you for sending the above-named application to the Faculty of Applied and Health Sciences Research Ethics Committee for review.

The application has been considered on behalf of the Committee by Andy Lovell as Lead Reviewer and reported to the Faculty Research Ethics Committee.

On behalf of the Committee, I am pleased to confirm a favorable ethical opinion for the above research on the basis described in the application form and supporting documentation.

The favorable opinion is given provided that you comply with the conditions set out in the attached document. You are advised to study the conditions carefully.

With the Committee's best wishes for the success of this project.

Yours sincerely,

Mohammed Saeed

Chair, Faculty Research Ethics Committee

Enclosures Standard conditions of approval.

c.c. Supervisor
FREC Representative

Appendix F:

Raw data

Initial data from first few of the total 142 participants

Section A

<u>Totals</u>	<u>%</u>	<u>Question</u>	<u>P1</u>	<u>P2</u>	<u>P3</u>	<u>P4</u>	<u>P5</u>	<u>P6</u>	<u>P7</u>	<u>P8</u>	<u>P9</u>	<u>P10</u>
89	63%	1	1						1	1	1	
79	56%	2							1	1	1	
6	4%	3										
5	4%	4										
96	68%	5	1	1		1	1	1	1	1		
21	15%	6							1			
16	11%	7								1		
64	45%	8	1		1		1	1	1	1		
30	21%	9	1		1					1	1	
84	59%	10	1		1		1	1	1	1	1	
31	22%	11							1	1	1	
71	50%	12					1		1		1	
51	36%	13					1		1		1	
74	52%	14					1		1	1	1	
37	26%	15					1		1	1		
7	5%	16									1	
71	50%	17	1				1		1	1	1	
30	21%	18					1		1		1	
37	26%	19	1						1			
47	33%	20	1		1				1			
23	16%	21				1			1		1	
8	6%	22										
46	32%	23							1		1	1
Total Correct Answers Per Person			8	1	4	2	9	3	17	11	13	1
Percentage Answers Correct			35%	4%	17%	9%	39%	13%	74%	48%	57%	4%
Total Correct Answers			1023									
Possible Correct Answers			3266									
Total Correct Answers			31									
Possible Correct Answers			69									

Section B

<u>Totals</u>	<u>%</u>	<u>Question</u>	<u>P1</u>	<u>P2</u>	<u>P3</u>	<u>P4</u>	<u>P5</u>	<u>P6</u>	<u>P7</u>	<u>P8</u>	<u>P9</u>	<u>P10</u>
137	96%	1	1	1	1	1	1	1	1	1	1	1
133	94%	2	1	1	1	1	1	1	1	1	1	1
118	83%	3	1	1		1	1	1	1	1	1	1
49	35%	4		1			1	1		1		1
25	18%	5						1		1		
78	55%	6		1		1	1	1	1	1	1	1
115	81%	7	1	1	1	1	1	1	1	1	1	1
91	64%	8		1	1	1	1		1	1	1	1
84	59%	9							1	1	1	

54	38%	10					1			1	1	
59	42%	11	1		1	1	1	1	1			1
17	12%	12						1			1	
33	23%	13										
67	47%	14			1			1		1	1	1
118	83%	15	1		1	1	1		1	1		1
111	78%	16	1		1	1	1	1	1			1
79	56%	17		1		1		1			1	1
88	62%	18	1		1	1		1	1		1	1
Total Correct Answers Per Person		8	8	9	11	11	13	11	12	12	13	
Percentage Answers Correct		44%	44%	50%	61%	61%	72%	61%	67%	67%	72%	
Total Correct Answers		1456										
Possible Correct Answers		2566										
Total Correct Answers		56.7										
Possible Correct Answers		43.3										

Section C

<u>Totals</u>	<u>%</u>	<u>Question</u>	<u>P1</u>	<u>P2</u>	<u>P3</u>	<u>P4</u>	<u>P5</u>	<u>P6</u>	<u>P7</u>	<u>P8</u>
113	80%	2-3 times a day					1		3	2
360	254%	once a day	4		7	1	4	2		1
249	175%	4-6 times a wk	1	2	4		2	2	1	3
492	346%	1-3 times a week	2	1	3	1	3	3	7	3
392	276%	2-3 times a month		2	4	4	8		1	3
7.022887324		Average Calcium / day	5.29	1.89	11.1	1.65	9.51	4.29	10.3	9.27

Section C

<u>Totals</u>	<u>%</u>	<u>Question</u>	<u>P1</u>	<u>P2</u>	<u>P3</u>	<u>P4</u>	<u>P5</u>	<u>P6</u>	<u>P7</u>	<u>P8</u>
22	15%	2-3 times a day			2				1	1
49	35%	once a day	2					3		1
49	35%	4-6 times a wk	1	3				1		2
132	93%	1-3 times a week	2	1	5		1	2	3	2
164	115%	2-3 times a month		2		1	6		5	1
2.545774648		Average other / day	3.29	2.6	6.45	0.09	0.83	4.29	3.82	5.59
<u>Totals</u>	<u>%</u>	<u>Question</u>	<u>P1</u>	<u>P2</u>	<u>P3</u>	<u>P4</u>	<u>P5</u>	<u>P6</u>	<u>P7</u>	<u>P8</u>
78	55%	Cereal	1		1	1	1		1	1
<u>Totals</u>	<u>%</u>	<u>Question</u>	<u>P1</u>	<u>P2</u>	<u>P3</u>	<u>P4</u>	<u>P5</u>	<u>P6</u>	<u>P7</u>	<u>P8</u>
20	14%	Supplement								
19	13%	Type								
Total			0	0	0	0	0	0	0	0

Section D

<u>Totals</u>	<u>Question</u>	<u>P1</u>	<u>P2</u>	<u>P3</u>	<u>P4</u>	<u>P5</u>	<u>P6</u>
134	5 - 7 times a week						1
233	2 - 4 times a week		1	5	2	2	
173	1 time a week		3	2	3	5	
11.80	Average times a week nb. A9 = divide by total respondents'	0	6	17	9	11	6

<u>Totals</u>	<u>Question</u>	<u>P1</u>	<u>P2</u>	<u>P3</u>	<u>P4</u>	<u>P5</u>	<u>P6</u>
2.78	2. TV Week			4	3	1	3
2.66	3. TV Weekend			4	2	2	2
2.58	4. Homework Week			2	1	2	2
2.25	5. Homework Weekend			2	1	2	1

- 1 = < 0.5 hours
- 2 = 1-2 hours
- 3 = 2-3 hours
- 4 = > 3 hours

nb. A9 = divide by total respondents'

	TVW	TVWE	HWW	HWWE
< 0.5 hours	12	13	14	32
1-2 hours	44	44	56	45
2-3 hours	30	40	26	33
> 3 hours	38	28	29	15

Summary Stats

Section A

Mean	7.204225352
Standard Error	0.365795962
Median	7
Mode	9
Standard Deviation	4.358961963
Sample Variance	19.0005494
Kurtosis	-0.791788462
Skewness	0.088103728
Range	17
Minimum	0
Maximum	17
Sum	1023
Count	142

Summary Stats

Section B

Mean	10.25352113
Standard Error	0.193655388
Median	11
Mode	11
Standard Deviation	2.307670281
Sample Variance	5.325342124
Kurtosis	1.98542851
Skewness	-0.911633423
Range	12
Minimum	2
Maximum	14
Sum	1456
Count	142

Appendix G: Specific participant answers relating to significant questions addressed in the questionnaire

1. How does osteoporosis knowledge link to dietary behaviour?

Participant numbers 7 and 83 both achieved the most correct knowledge answers for osteoporosis and consumed 10 and 4 portions of calcium over the week.

Participant numbers 72 and 20 both achieved the lowest correct knowledge answers for osteoporosis and consumed 20 and 2 portions of calcium during the week.

The results between these four subjects vary making it hard to prove a connection in this study between osteoporosis knowledge and behaviour.

2. How does osteoporosis knowledge link to physical activity behaviour?

Participant numbers 7 and 83 both achieved the most correct knowledge answers for osteoporosis and participated in 25 and 8 sessions of physical activity over the week.

Participant numbers 72 and 20 both achieved the lowest correct knowledge answers for osteoporosis and participated in 4 and 9 sessions of physical activity during the week.

The results between these four subjects vary making it hard to prove a connection in this study between osteoporosis knowledge physical activity participation.

3. How does diet knowledge link to diet behaviour?

Participant numbers 13 and 51 both achieved the most correct dietary knowledge and consumed 7 and 4 portions of calcium over the week both having breakfast cereal with milk.

Participant numbers 19 and 83 both achieved the lowest correct knowledge answers for correct dietary knowledge and consumed 4 and 2 calcium portions and participant 19 had cereal with milk whilst participant 8 did not.

The results between these four subjects vary making it hard to prove a connection in this study between dietary knowledge and dietary behaviour.

4. How does physical activity knowledge link to physical activity behaviour?

Participant numbers 13 and 51 both achieved the most correct knowledge answers for physical activity behaviour and participated in 31 and 7 sessions of physical activity over the week.

Participant numbers 19 and 81 both achieved the lowest correct knowledge answers for osteoporosis and participated in 6 and 11 sessions of physical activity during the week.

The results between these four subjects show a connection between having more physical activity knowledge and more physical activity participation.

Appendix H: Medical advances article: future of bone health

Medical developments continue to be made, a leading UK newspaper reported a miraculous healing power for bone health by daily injections of hormone which can in “turn back the clock” and help patients recover from fractures quicker. Used to treat osteoporosis or brittle bones, it increases the ability of fractures to heal themselves and is reported to significantly reduces the pain to sufferers. ‘Teriparatides’ boosts the amount of stem cells (the bodies’ master cells in the bones).

A larger clinical trial is needed but it was welcome news for Dr Claire Bowring (the medical policy officer for the National Osteoporosis Society) who respects any creditable clinical advances. (*guardian*, 2009).

Appendix I: MP contact

DR ANDREW MURRISON MP

HOUSE OF COMMONS

LONDON SW1A 0AA

Your email has been received and will be dealt with as soon as possible.

Dear Mr Murrison

I was wondering whether you could help me.

I have recently conducted a questionnaire based study on Osteoporosis knowledge and understanding amongst adolescent girls between 12-16 years old (this age is crucial in bone development and is the best age to prevent osteoporosis occurrence for later life). I was concerned to find out that the vast majority of girls knew very little on this subject.

I am in contact with the National Osteoporosis Society (NOS) who are raising awareness but as its not yet part of the national curriculum I was wondering whether you had any ideas as to how get the prevention message of calcium, vitamin D and good lifestyle choices across to a these girls (who currently avoid certain calcium products because they perceive them as 'fattening' and do not eat alternative calcium foods).

Osteoporosis can cost lives and is costly on the NHS which is of a growing concern.

Are you aware of any available funds of raising educational awareness in secondary schools and are you aware of the NOS and the good work that they are doing?

I look forward to your response, many thanks in advance.

Debbie Savin

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 Miss I NL Williams,

 Miss B M Williams,

 Mrs A B Savin, Mr D W Savin,

 Miss L Riddiford and Mr A Savin.

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 Mrs S Brown

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