# SEDENTARY LIFESTYLE PREVALENCE AMONG WORKERS IN KENYA AGRICULTURAL AND LIVESTOCK RESEARCH ORGANIZATION IN KENYA

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**ABSTRACT**
People who spend too much time being sedentary are more likely to develop musculoskeletal disorders and other non-communicable diseases (NCDs). This health risk is likely to increase with increasing sedentary office setting and lifestyle. In Kenya, the sedentary lifestyle is on the increase while its baseline data has not been documented appropriately. This study investigated sedentary lifestyle prevalence among workers in seven selected institutes within Kenya Agricultural and Livestock Research Organisation (KALRO). The study concentrated on a population of 820 office and laboratory workers in seven KALRO institutes located in the Nairobi Metropolitan. The sample size (n= 96), was calculated using Daniel's formula for prevalence studies. A Cross-sectional survey was employed on respondents and questionnaires administered. Waist to height ratio (WHtR) and waist circumference (WC) was measured using a stretch-resistant tape in accordance with WHO, 2008 guidelines. The WHtR (>0.5) revealed that prevalence of overweight and central obesity was high in females, (92.6%) than in males (88%) while (90.38%) was for combined male and female respondents. Factors influencing sedentary lifestyle most of which were outside the workplace setting were: use of motorized transport (73%) which increased with social-economic status; screen time (64.7%); reliance on house help for domestic chores (56.5%) and occupational sedentary (78.4%) with p>0.5 for sitting for office and laboratory workers. None of the sampled institutes had invested in ergonomic chairs, policies or programs for NCDs screening and management. The study concluded that there was a high prevalence of sedentary lifestyle among KALRO employees in the selected institutes. These findings provide a basis for management in KALRO to encourage physical activity among its workers by intervening at individual (reduction of television viewing and overall volume of unbroken sitting time); environmental (introducing active workstation where they live, work); and policy level (allowing regular desk breaks, introduction of standing/walking meetings, guidelines on how long a sitting meeting should last).
**Keywords:** KALRO, musculosketal,obesity, policies, prevalence, sedentary.

## INTRODUCTION

Most of the sedentary jobs are the white collar jobs which majority of Kenyans associate with hefty pay checks and prestige (Christine, 2010). This category of workers is at a greater risk of low occupational physical activity(PA) and high sedentary time (Smith *et al*, 2016). They are more likely to develop chronic conditions and other non- communicable diseases (NCDs). The reason for this increase of low PA may be attributed to a large shift towards less physically demanding work in the office setting, passive transport, technological advances in the house, and more passive pursuits for leisure thus making the working population to be more exposed to sedentary behaviour (Parry and Straker, 2013). According to the Kenya National Strategy for the Prevention and Control of NCDs (2015) report, (NCDs) are the leading causes of morbidity and mortality globally, causing more deaths than all other causes combined, and they strike hardest at the world's low and middle-income populations. The major NCDs according to the report are cardiovascular conditions (13%), cancers (7%), and diabetes (4.56%). This trend is worrying and could be the reason why WHO, 2006 raised a red flag and warned that if serious measures are not taken by 2020, NCDs will account for 73% of all deaths globally. According to Shi, (2015) in Kenya, the fight against these NCDs which accounts for 27% of deaths suffered by workers in their productive years (30-70 years) is complicated by cultural factors including the perception of overweight and obesity as a sign of prosperity associated with white collar jobs.

Most adults spend about 8-12 hours per day being sedentary out of the average 16 waking hours (Mathews *et al*, 2008). According to Hamilton *et al*, (2007) being too sedentary has negative health effects. This occurs because sitting for long period results in reduced use of the large muscles in the back, trunk and legs. These large muscles consume much of the body's intake of sugars and fats. So not using these muscles when sitting down, means there are higher than normal levels of blood glucose and fats increasing the risk of range of health conditions such as obesity (Hamilton *et al*, 2007). When one is seated, the lower part of the leg has no activity. Being in this position on a regular basis predisposes a person to blood clots (Kabrhel *et al*, 2011). Desk jobs also tends to make a person to develop a bad posture adopted from the kind of chair they are using. This brings about fatigue and muscle soreness for the individual who does his work while seated (Kirigo, 2012).People who spend too much time being

sedentary have a higher mortality rate than people who are less sedentary and are more likely to develop type 2 diabetes and cardiovascular diseases (Baumann *et al*, 2013). The World Health Organisation (WHO) in its Global Strategy on Diet, Physical Activity and Health, (2017) held that globally around 31% adults aged over 15 were insufficiently active in 2008 with men at 28% and women 34%. About 3.2 million annual deaths are attributable to insufficient physical activity (WHO, 2018). In 2008, prevalence of insufficient activity was highest in Americas and Eastern Mediterranean region. The current level of physical inactivity are partly due to insufficient participation in PA and an increase in sedentary behaviour during occupational and domestic activities (WHO, 2017).

On transportation, Owen *et al,* (2011) argues that use of cars in suburban areas has lengthened the period of sedentariness by sitting in cars to perform a journey to and from work places and short journeys to attend to family and friends. On occupation, employers should ensure their workers do not spend over 50% of work day sitting as a way of providing a safe system of work (Brigid, 2015). In Kenya, the Occupational Health and Safety Act, 2007 is not explicit on duties of the employer in reduction and prevention of sedentary lifestyle. A lifestyle described by the World Day of Safety and Health at Work, (2015) as a new hazard fuelled by the growing use of computers and automated systems.

The present study was set to investigate sedentary lifestyle prevalence among workers in selected institutes in Kenya Agricultural and Livestock Research Organization (KALRO). It focused on office and laboratory staff characterised by sedentary behaviour. With a population of more than 2000 employees, KALRO is a major employer in the agricultural and livestock sector in Kenya. The organisation plays a critical role in the realisation of Vision 2030 which places major emphasis on research in technology generation and creation of new knowledge considered as kingpins in national development. These goals will be achieved if the health and safety of employees is treated as paramount as advocated by the United Nations Sustainable Development Goal 3; Science Technology and Innovation for Africa (STISA, 2024); and Kenya Vision 2030 where health is a constituent of social pillars. The results of this study provide a basis for policymakers in KALRO to develop policies and programs for a reduced sedentary lifestyle.

According to Xu *et al*, (2010) Metropolitan or urban setting has an influence on sedentary lifestyle and adolescents from urban settings are more likely to be overweight and obese. The proximity of institutes and their location informed the decision to choose Nairobi Metropolitan region as the study area. The selected institutes were: coffee (Ruiru-Kiambu), horticulture (Thika-Kiambu), veterinary (Muguga-Kiambu), agricultural mechanization (Machakos), genetic resources (Muguga-Kiambu), food crops and biotechnology (Lower Kabete Nairobi).

## MATERIALS AND METHODS

The study concentrated on a population of 820 workers in offices and laboratories in seven KALRO institutes located in Nairobi metropolitan which formed the study area. The sample size, n= 96 was calculated using Daniel's formula for prevalence studies. Cross sectional survey was employed and two sets of structured questionnaires were administered. One set gathered workers' data on sedentary lifestyle and parameters influencing occupational sedentary behaviour, while the second assessed the available policies and programs in the selected institutes aimed at mitigating sedentary lifestyle among the workers.

The respondent's waist circumference was measured in centimetres at the midpoint between the lower margin of the least palpable rib and the top of the iliac crest using a stretch to resist tape that provides a constant 100gram tension as provided by the WHO, 2008 guidelines. The subjects were requested to wear light loose clothing and stand with feet close together, arms at the sides and body weight evenly distributed. Standing height was measured to the nearest 0.1 centimetre using the same tape for waist circumference. The subjects were requested to remove shoes, slippers and socks before the measurements were taken. The waist to height ratio (WHtR) was calculated and recorded by dividing waist size (cm) by height (cm). Data was processed using statistical package for social sciences (SPSS Version 20) and MS Excel computer software. Analysis was done using frequencies and statistical tests. The data was also subjected to statistical correlational tests using measure of central tendency to determine relationships between independents variables. Spearman Rho and Kendalltai-b was used to check similarlities in data collected. Permission to undertake the study was sought from the relevant authorities including National Commission for Science, Technology and Innovations license. Data was presented using statistical tables and charts.

## RESULTS AND DISCUSSION

The social demographic characteristics revealed that the respondent's gender was 46.3% male, 50% female and 3.7% non response while 57.4% were married, 33.3% single,5.6% widowed 1.9% separated and 1.9% nonresponse. The respondent's level of education was 92.6% tertiary/university and over with 55% of them working in the office, 42 % in laboratories, and 3% serving in the field.

**Available policies, programmes and health facilities at the work**

The results indicated that 43% of the selected institutes had operational health facilities which inferred that only 360 employees out of the total study population of 820 or 44% had access to in house medical services. Workers spend the better part of their waking hours at the work place and there was no better place to have a medical staff on hand. In addition, treating sore throat, cut fingers, helping employees stay healthy by offering on site preventive tests, screening and healthy coaching to encourage healthful habits were areas of interest (Mitchel, 2011). Further, to mitigate sedentary lifestyle in the workplace, it is necessary for the employers to encourage workers to participate in physical activity. However, this may not be possible if the medical condition of the workers is not known and documented. For example, it may not be safe for workers with known high blood pressure or rheumatoid arthritis to join in the physical activity without medical approval. By understanding the workers' health profile, the health provider in the health facility can identify the risk factors within the respective institute and maintain record and follow ups which may provide the required interventions to ensure that all workers can safely participate in more physical activities.

**Physical fitness and member of gym/sports club**

None of the selected institutes had any organized programs that encouraged workers to engage in exercise and fitness by allowing for physical activity and membership of a gym or sports club**.** This meant that the management of the sampled institute did not find it necessary to encourage physical activity and a safe system of work among the workers.

**Organized quarterly screening programs**

The respondents' response to organised screening programs was poor as only 14% of the study institutes posted good response. This was indicative of lack of awareness among the KALRO employees on the importance of lifestyle diseases screening, management and health surveillance. The researcher deduced that the management in the selected KALRO institutes had poor organizational facilitation and approaches to synthesize and encourage their employees to live a non-sedentary lifestyle. According to the Conference Board of Canada, (2015) employers have specific interventions to reduce physical inactivity and sedentary behaviour by, educating employees on the benefits of increasing physical activity and reducing sedentary behaviour; providing opportunities for employees to participate in physical activity and minimize sedentary behaviour during the workday; ensuring that employees take regular movement breaks in order to reduce their sedentary time.

**Employer's promotion of workers wellbeing at the work place**

The results revealed that all the selected institutes had centralized waste bins to encourage worker to take light exercises by walking to the bins. Among the selected institutes, 42.9% allowed regular breaks from sitting by standing up every 30 minutes and 71.4% provided drinking water in their laboratories and offices so as the employee could take water frequently and have frequent visit to the washrooms. Employers should ensure that their workers do not spend significant amount of time sitting, otherwise they could be breaching health and safety obligation to provide a safe system of work by reducing their workers sedentary time (Allana, 2018).

Of the sampled respondents, 64.8% indicated they had been sitting on the same chair for more than five years. The observation made by the researcher was that in all the sampled seven institutes, non-had invested in ergonomic chairs. Workers spend more time sitting on an office chair than on anything else often for more than eight hours a day as was evident in our results on occupational sedentary. This then means a well-designed, comfortable sitting option is important for improved posture and performance not to mention keeping back pain, muscle soreness and neck pains at bay (Kate, 2017).

The study argues from these results that due to their work place environment and posture, KALRO employees over time may gradually become unproductive and the selected KALRO institutes may find themselves with large staff turnover coupled with significant health bills occasioned by sitting on worn out non-ergonomic chairs.

**Available policies to mitigate sedentary lifestyle and work environment**

The results indicated that none of the selected institutes had a: Policy on how to hold walking meetings; Policy on how to hold standing meetings; Policy on maximum time a normal siting meeting should take. Only one (Coffee Research Institute) out of the seven sampled institutes had a policy to address ergonomics and work place design.

All selected institutes reported that they did not provide electronically adjustable desk with integrated treadmill or a treadmill and a stationary cycle ergometer. The data analysis indicated that none had either an active workstation or work site programs targeting obesity factors such as behaviour change modifications, health education, health risk assessment and appraisal, or weight and stress management. The results deduce that KALRO work environment encouraged employee to have a sedentary lifestyle at the work place.

**Employees at risk of physical in-activity in KALRO institutes**

***Waist to Height Ratio (WHtR)***

The results of WHtR by gender were as shown in Table 1. The measurement of waist to height ratio (WHtR) and waist circumference (WC) indicated that the prevalence of overweight and obesity was higher in females at (92.6%) than in males at (88%). This was in agreement with a study by Yin *et al*, (2014) on prevalence and factors associated with physical inactivity among Malaysian adults which found out that females were more likely to be more physically inactive than males. The prevalence for both gender combined was 90.38%. This high percentage of total staff with WHtR >0.5 indicated a sedentary lifestyle prevalence among the sampled KALRO staff in the selected institutes. Further, the correlations test revealed that WHtR increased with income, *($\tau_b$ = 0.070, p= 0.516*) and had an influence on ailments such as fatigue and muscle soreness after a day's work (*p=0.657)*. WHtR has been proposed as an alternative measure of obesity (Trent and Jane Watson, 2016) and it is a good proxy for central fat which has a greater health risk than fat stored in other parts of the body. The WHtR range of all the participants was as shown in Figure 1.

**Table 1. WHtR ratio by gender**

| Gender | With WHtR below 0.5 | With WHtR above 0.5 | Total | % WHtR below 0.5 | % WHtR above 0.5 |
|---|---|---|---|---|---|
| Female | 2 | 25 | 27 | 7.41 | 92.59 |
| Male | 3 | 22 | 25 | 12.0 | 88 |
| Total | 5 | 47 | 52 | 9.62 | 90.38 |

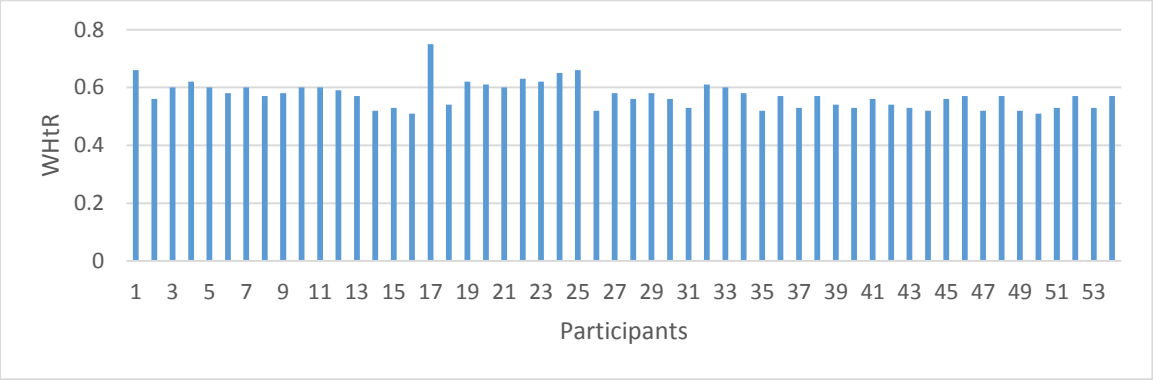


**Figure 1. WHtR for KALRO staff**

**Table 2. Waist circumference of participants per gender**

| Females | Waist below 88.9 cm | Waist above 88.9cm | Total | % WC > recommended waist size |
|---|---|---|---|---|
| | 5 | 22 | 27 | 81.48 |
| Male | Waist below 101.6cm | Waist above 106.1cm | Total | % WC > recommended waist size |
| | 23 | 2 | 25 | 8 |
| Combined | 28 | 24 | 52 | 46.15 |

***Central Obesity - Waist Circumference***

The recommended waist circumference (WC) by WHO, 2008 is ≤102cm for men and ≤88 cm for women. The WC measurement carried out on respondents of both gender was as shown in Table 2.

The waist circumference results indicated that (81.48%) of sampled females had measurements above the recommended 88.9cm while for men only (8%) had measurement above the recommended 101.6cm. This was an indication that more females were obese than males in the selected institutes in KALRO. Measuring a person's WC is the simplest way to assess central obesity. According to a study on assessing factors related to WC and obesity by Sahar, *et al*, (2015) there exists an association between high WC and high prevalence of obesity. Both the WHtR and WC results showed that there was significant central obesity among male and female workers. This was indicative that the sampled staff at KALRO were at risk of NCDs and obesity related diseases such as stroke, cardiovascular and diabetes according to Ashwell, (2005). Aswell and Swanson, *et al* (2017), also indicated that individuals with WHtR > 0.5 had a lower life expectancy. Similarly, Hsieh, *et al*, (2002) also averts that individuals with WHtR > 0.5 values are overweight and are at risk of metabolic disorders and chronic NCDs. These results further revealed that the sampled KALRO staff in the selected institutes had a sedentary lifestyle because significant number of them had high central obesity values. The two

measures employed were established anthropometric indices for the prediction of NCDs and according to a study on Taiwanese adults by Wen- Cheng Li, *et al*, (2013), a WHtR >0.5 effectively indicates central obesity. Further, the study sought to establish the statistical correlations between the respondents' age, waist circumference, WHtR, and income per month and the results were as shown in the Table 3.

**Table 3. Statistical correlations between age, waist circumfrence and monthly income**

| | | | Age | Waist circumference in cm | Waist to Height Ratio | Income per month in Kenya Shillings |
|---|---|---|---|---|---|---|
| Kendall's tau_b | Age | Correlation Coefficient | 1.000 | .100 | .102 | **.396**$^{**}$ |
| | | Sig.(2-tailed) | . | .365 | .344 | **.001** |
| | | N | 53 | 52 | 52 | 53 |
| | Waist circumference in cm | Correlation Coefficient | .100 | 1.000 | **.625**$^{**}$ | .069 |
| | | Sig.(2-tailed) | .365 | . | **.000** | .526 |
| | | N | 52 | 52 | 52 | 52 |
| | Waist to Height Ratio | Correlation Coefficient | .102 | **.625**$^{**}$ | 1.000 | .070 |
| | | Sig.(2-tailed) | .344 | **.000** | . | .516 |
| | | N | 52 | 52 | 52 | 52 |
| | Income per month in Kenya Shillings | Correlation Coefficient | **.396**$^{**}$ | .069 | .070 | 1.000 |
| | | Sig.(2-tailed) | **.001** | .526 | .516 | . |
| | | N | 53 | 52 | 52 | 53 |

From the analysis it was observed that there was a positive correlation between respondents' age and waist circumference measurements ($\tau_{b=}$ *0.100, p=0.365*). This indicated that the respondent physical activity reduced as they advanced in age and as their earnings per month increased ($\tau_{b=}$ *0.396, p=0.001).* The WHtR >0.5 had an influence on respondents' ailments. It was further observed that the correlation between WHtR and fatigue /muscle soreness after a day's work was p=0.657. This indicated that respondents with WHtR >0.5 were likely to complain of fatigue and other related ailments.

Most respondents spent significant time sitting (78.4%) in the place of work as compared to walking within the office/laboratory (15.6%) or lifting heavy objects (6%). This meant that occupational sedentary was high among the respondents. The results were in agreement with Allan, (2018) who argues that on occupation domain, employers should ensure that their workers do not spend significant amount of time sitting as a way of providing a safe system of work.

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**Lifestyle Trends**

The study sought to follow the respondents' lifestyle trends taking into consideration that they were spending too much time sitting in the workplace (78.4%) and that they were working for a *mean* of 41.1 hours in a 5 days' week. It was therefore necessary to establish whether this sedentary lifestyle followed them at home by assessing how they spent their weekend and leisure time. This was revealed by respondents by giving details on how many hours they spent watching television at home after work and how they spent a typical weekend.

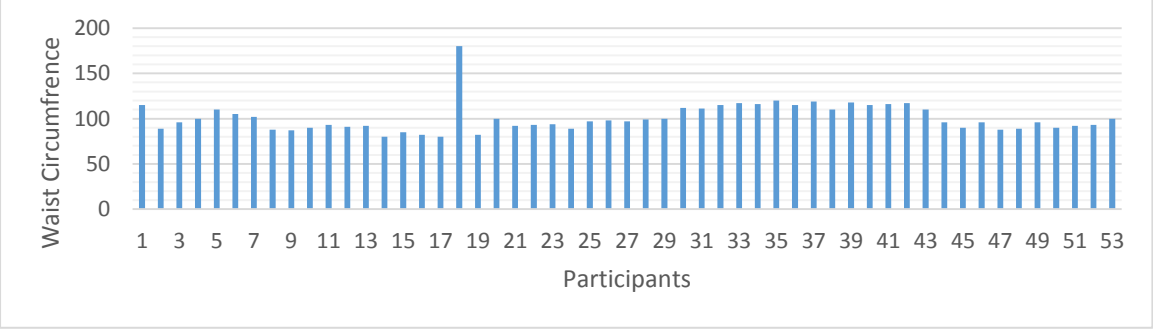


**Figure 2. Waist of participants**

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***Time spent by the respondents commuting to work***

The study sought to establish the time spent sitting in the cars to perform a journey to and from respondents' workplaces while on motorised transport. The results revealed that (44.6 %) spent more than 1 hour in traffic which was attributed to traffic jams experienced during the peak hours in Nairobi metropolitan region. The long-time taken to commute to and from work added to the respondents' sedentary time. This falls under transportation domain where Owen *et al*, (2011) argues that use of cars in suburban areas has lengthened the period of sedentariness which refers to the amount of time spent in the cars to perform a journey to and from workplaces and short journeys. Statistics for skewness and kurtosis if one used motorized transport and how long they took to commute to and from work revealed a skewness of 0.133 and a Kurtosis of 3.172 showing it was not normally distributed but had significant kurtosis towards spending 60 minutes.

***Occupational sedentary***

The occupational sedentary was assessed using the section in the questionnaire which sought to know the workplace sitting profile. The analysis indicated that the respondents worked an average of 41.6 hours in a week with a *standard deviation* of 14.5. The data for how many hours per week had a *skewness* of -0.935 and a kurtosis of 4.657 showing that it was not normally distributed but had a kurtosis towards working for 40 hours per week. On the number of days per week, the data had a *skewness* of 2.496 and a *kurtosis* of 10.285 which was indicative that the data was not normally distributed but was *kurtotic* around 5 days per week. This was indicative that most respondents worked an average of 40 hours in a 5 days week.

The analysis on how respondents described their typical working day in the last 7 days indicated that those who worked in the field spent most of their time walking and did not respond to sitting down and driving option. The results using Shapiro-Wilk showed $p>0.5$ for sitting for office workers, standing and sitting for laboratory workers.

Further,on gender basis, the males respondents had a *skewness* of 1.905 for hours worked per week and females had –0.782. The data was skewed for males but approximately normally distributed for females. The *kurtosis* of 2.707 for males and 2.321 for females indicated the data was *kurtotic* for both male and female. For the number of days worked in a week, the results revealed females had a *skewness* of 2.602 and a kurtosis of 11.75 while males had a *kurtosis* of 10.78 and skewness of 2.7. This showed that for both male and female respondents, the data was both skewed and *kurtotic* which further inferred that the data was independent of gender. Thus, both male and female worked 40 hours per 5 days week. By analysing the skewness and kurtosis for gender against the number of days and hours worked, the results were as shown in figure 3.

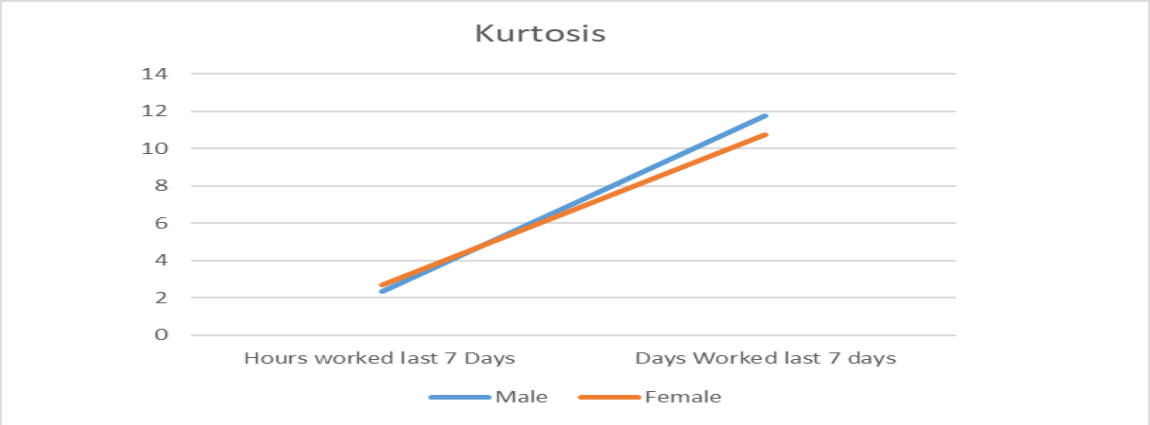


**Figure 3. Kurtosis analysis: Gender against days and hours worked in a week**

The study then observed the following:

(a) On weekends most of the respondents spent significant proportion of their time watching TV. Notably 64.7% of the respondent spent over 15 hours in front of the TV on weekends.
(b) It was also observed that 88.5% respondents who spent time watching TV did so while lying on a couch as opposed to sitting on an arm chair although inactivity is the culprit whether lying or sitting down. Thyfault, (2010) argues that the problem is we don't use our legs when we sit or lie prone. Our legs and backside contain some of the largest muscles in our body. When we have unbroken sitting in a chair or lounge on a couch, these muscles are slack and levels of blood sugar and bad cholesterol rise adversely affecting the health of the culprits.
(c) Only 23.1 % confirmed that they used dish washer and washing machine at home. The respondents' level of mechanization of house chores was low for low and high income cadres.
(d) On housework domain, the results indicated that 57.7% of the respondents delegated all their house chores to house helps.

In PA domains, house chores fall under the four major domains category which includes transportation, occupational and leisure. According to Kindula (2014), in Kenya, nearly everyone, except the very poor, hires domestic help. Further, a study by Alex *et al,* (2006) on practice of physical activities and associated factors in adults in Brazil found out that the proportions of active individuals were, (14.8%) leisure, (38.2%) occupational, (11.7%) transportation, and (48.5%) household chores. This was in agreement with the results of this study as it was observed that, 57.7% of the respondents delegated all their house chores to house helps after spending significant time (78.4%) sitting in the office and (44.6%) in the traffic for more than 60 minutes.

Kirigo, (2012) confirmed such lifestyle reduces use of their large muscles, back trunk and legs hence reduction of the body intake of sugar and fats thus increasing their health risk and tendency to develop obesity. Those who spend a lot of time sitting down have a predisposition of having blood clots, developing a bad posture and frequent fatigue and muscle soreness (Kirigo, 2012). From this, the researcher deduced that KALRO employees in the selected institutes were sedentary and were at risk of developing type 2 diabetes and cardiovascular disease. Type 2 diabetes is the most common type of diabetes that occurs when the blood glucose also known as blood sugar is too high.

Further analysis using Spearman revealed that there was a negative correlation at (p= - 0.01) significant level, which was an indication that those respondent who earned higher income were the ones who had dish washers and washing machines. This meant that as the respondents earned more they acquired house help to do all their house chores. The researcher observed that respondents used house help as compared to using mechanized methods of cleaning clothes and dishes and the ones who had high income (> 46000 making up 56.5%) were the ones who employed house help to perform their house chores.

## CONCLUSION

There was high prevalence of sedentary lifestyle among KALRO employees in the selected institutes. The high number of both male and female respondents with WHtR above 0.5 and WC above the recommended 88.9 cm for females and 101.6 cm for males was indicative of sedentary prevalence among KALRO employees. Female employees were considered to have higher sedentary prevalence. Use of motorized transport, screen time and delegation of house chores to house helps played a significant role in the prevalence of sedentary lifestyle among KALRO employees in the selected institutes. These factors increased with earnings, social economic status and age.

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## REFERENCES

Alex, A.F., Pedro. C.H., Erly, C.M. and Deborah. C.M. 2006. Practice of physical activities and associated factors in adultds in Brazil. Revista de Sande Publica ISSN 0034-8910. sRev. Sande Publica. 43(Supl. 2) Sao Paulo.

Ashwell, M. 2005. Waist to height ratio and the Ashwell shape chart. Nutrition and Food Science 35(5):359-64.

Christine, M. 2010. StoryMoja Careerpedia, plan your future. *info@storymojaafrica.co.ke*

Conference Board of Canada. 2015. Workplace intervention to reduce physical inactivity and sedentary behaviour. http://www.e-library.ca

Furlan, A. 2015. Seven major risks of sedentary work. Health and Safety Bulletin, Porter Press 2018

Hamilton, M., Genevieve, N.H., David, W.D., Theodore, W.Z. and Neville, O. 2008. Too little Exercise and Too Much Sitting: Inactivity physiology and the need for new recommendations on sedentary behaviour: Curr Cardiovasc Risk Rep., 2(4):292-298.

Hsieh, S.D., Yoshinga, H. and Muto, T. 2002. Waist to height ratio, a simple and practical index for assessing central fat distribution in Japanese men and women. Medical and Centre of health Science Taranomon Hospital, Taranomon 2-2-2 Minato Tokyo 105-8470, Japan

Kabrhel. C., Varraso, R., Goldhaber, S.Z., Rimm, E. and Camargo, C.A. 2011. Physical inactivity and idiopathic pulmonary embolism in women: Prospective study. BMJ, 34 (Jul04 1): d3867 DOI: 10.1136/bmj.d3867

Kate, H. 2017. The Independent – 9 best ergonomic chairs. Retrieved from www. Independent .co.uk

Kenya National Strategy for the Prevention and Control of Non Communicable Diseases. 2015. Ministry of health MOH/CDC Co Ag. IANPHI, Redcross and WHO.

Kenya Stepwise Survey for Non-Communicable Diseases Risk Factors (2015) report; Division of Non-Communicable Diseases, Afya House, Nairobi, Kenya

Kidula, O. 2014. The plight of domestic worker in Kenya. www.afromum.com/plight-domestic-worker-Kenya.

Kirigo, V. 2012. Sitting killing you softly. Health and Science

Lina, T.S., Patricia, W. and Shilpa, D. 2016. AIMS Public Health 3(3):555-572. DOI: 10-3934/public health.2016.3.555 http/www.aimspress.com/jurnal/aimsph

Mathews, E.C., Kong, Y.C., Patty, S.F., Maciej, S.B., Bettina, M.B., Russel, R.P. and Richard, P.T. 2003. Amount of Time Spent in Sedentary Behaviours in the United States. Am J Epidemiol., 167(7):875-881

Naing, L., Winn, T. and Rusli, B.N. 2006. Practical issues in calculating the sample size foe prevalence studies. Archives of Orofacial Sciences 2006: 9-14.

Owen, N., Genevieve, N.H., Charles, E.M. and David, W.D. (2010). Too much sitting: The population-health Science of sedentary behaviour: Exer Sport Sci Rev., 38(3):105-113.

Parry, S and Straker, L. 2013. The contribution of office work to sedentary behaviour associated risk: BMC Public Health; https://doi.org/10.1186/1471-2458-13-296

Pouran, F., Kelly, S. and Kamyar, M. 2015. Sedentary lifestyle, obesity and aging: Implication for prevention: Journal of Nutritional Disorders and Therapy. Volume 5; doi 10.4172/2161-0509, 1000e119

Rantanen, J., Suvi, L., Antonio, V. and Sergio, L. 2017. Global survey on occupational services in selected international commission on occupational health member countries. BMC Public Health. doi:10.1186/s 12889-017-4800-z

Shi, J. (2015). Non-Communicable Diseases in Kenya, Vector Magazine, Amsa global health.

STISA-2024. 2014. African Union Commission Roosevelt street, W21K19 Addis Ababa Ethiopia. http//au.int/site/default/files/newsevents/33178

Sugiyama, T.S., J. Dunstan, D.W., Bauman, A.E., Owen, N. 2007. Neighbourhood Walkability and TV Viewing among Austrarian Adults: Am J Prev Med 33(6):444-9.

Swainson, M.G., Betterham, A.M., Tsakirides, C., Rutherford, Z.H., Hind, K. 2017. Prediction of whole body fat percentage and visceral adipose tissue mass from five anthropometric variables. PLoS ONE 12 (5); e0177175 doi: 10.1371 / journal pone.0177175.

Thyfault, J.P. 2010. Physiology and pathophysiology of physical inactivity. J. Applied Physiology American Physiol. Society http/doi.org/10.1152/applphysiol.00478.2011

Trent, A. W. andWatson, J. 2016. Obesity and the NSW Mineral Industry. Ethos Health NSW Mineral Council 46:26-31.

Wen-Cheng Li., Chuan Chen., Yu-Che Chang., Song-Seng Loke., Shi- Hao Wang. and Kuong Yu Hsiao. 2013. Waist-height ratio, waist circumference and body mass index as indices of cardio metabolic risk among Taiwanese adults. Eur J Nutri., 52(1):57-65

World Health Organization. 2008. Guidelines on waist circumference measurements. A report of WHO expert consultation, Geneva, 8-11 December 2008

World Health Organization. 2016. Sustainable development goals. SDG3: Ensure healthy lifes and promote well being for all at all ages.http://www.who.int/sdg/targets/en

World Health Organization. 2017. Global health observatory data. WHO annual World Health Statistics report

World Health Organization. 2017. Global strategy on diet, physical activity and health: WHO prevention of non-communicable diseases (PND) 20 Avenue Appia 1211 Geneva 27 Switzerland

Xu, Fie., JieQuan., Ya Qiong Liang., Xhi Yong Wang., Xin Hong., Robert S. Wave., Eva Lesli., Sugiyama, T. and Owen, N. 2010. Association of residential density with adolescent's physical activity in a rapidly urbanising area of main land China. J Urban Health PMC 2821610 doi: 10.1007/s 115224-009-9409-9

Ying, Y.C., Chien. H.T. and Lim, K.K. 2014. Prevalence and factors associated with physical inactivity among Malaysian adults. South Eastern Asian Journal of Tropical Medicine and Public Health 45(2).