

Prevalence of Lactic Acidosis Syndrome in People Taking Antiretroviral Drugs at a Local Health Centre

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ABSTRACT

This study examines the types of antiretrovirus (ARV) drugs and the foods taken by people who are HIV positive. The study aims to establish whether the drugs and food consumed are associated with the development of lactic acidosis. A sample of 20 people drawn from a population supplied with ARV drugs at a local polyclinic was used. Questionnaires and interviews were the main tools used in the study to gather information on the types of ARVs, their side effects and the dietary regimen for people who were prone to lactic acidosis. The results established that the ARV drug combinations of lamivudine, stavudine and nevirapine and ritonavir, stavudine and nevirapine were taken by the sample population, and that part of this population experienced symptoms associated with lactic acidosis. The results also established that the dietary regimen for those who experienced the symptoms of lactic acidosis was carbohydrate dense, included acid forming foods, such as fermented foods and was limited on vegetables and citrus fruits. The research findings indicate a knowledge gap among HIV positive people on food choices and recommended dietary regimens. The researcher recommends that nutritionists and dieticians produce and distribute pamphlets, magazines, flyers and recipes with the recommended dietary regimen for HIV positive people and that income generating projects be set up to ensure adequacy of food supply in their homes. Based on the findings the researcher proposes a dietary regimen that may be suitable for HIV positive people.

Keywords: ARV drugs, dietary regimen, HIV positive, lactic acidosis, regimen.

I. INTRODUCTION

Lactic acidosis is a disease characterized by unexplained weight loss and elevated blood lactate levels [1]. This disease is a result of either over production or under utilization of lactate. Lactic acid is produced as a byproduct in cells during process of glycolysis. Once produced, the lactic acid is excreted by the liver and kidneys. Its accumulation lowers the blood pH leading to the development of lactic acidosis, characterized by elevated lactate levels usually greater than 5 meq/ L and decreased

bicarbonate concentrations [2,3]. Under normal circumstances, lactate should not be present in blood at concentrations greater than 1.5 meq/L [4,5].

It was established that lactic acidosis is commonly found in people with diseases involving circulatory collapse and in HIV people taking specific antiretroviral drugs [6]. ARV drug combinations are given to HIV positive people to prolong life. However some ARV drug combinations produce toxic acids or damage cells/leucocytes [7]. Stavudine, which is administered in combination with lamivudine and nevirapine or ritonavir and nevirapine exhibit such toxic effects. People taking these drug combinations may develop liver problems associated with lactic acidosis [2]. Studies have shown that women with CD4 count higher than 250 cells per mm³ are at greater risk of developing lactic acidosis [7]. Lactic acidosis can also be attributed to improper diet.

Foods that are acidic like some fruits and fermented foods may increase the blood acidity level in HIV positive people increasing the chances of developing lactic acidosis [8,9]. Consumption of sugary foods tends to increase glucose levels in the body [10]. Under conditions of hypoxia, excess glucose is converted to lactic acid which might accumulate resulting in lactic acidosis. Causes of lactic acidosis can be medical, related to immunology or dietary [11]. Doyle [12] reported that lactic acidosis can be caused by organs (liver kidney, liver) disorders, obesity, stress, fear and malnutrition. According to Hopewood [13], anti diabetic drugs also cause lactic acidosis.

This study seeks to evaluate whether the prevalence of lactic acidosis in HIV positive people getting treatment from a local clinic was associated with ARV drug consumed and/or dietary regimen. Most studies on lactic acidosis were done on diabetic and cancer patients [14-16]. To the best of our knowledge no such studies have been reported on people affected by HIV. The investigation seeks further to come out with recommendations on how to reduce or eliminate factors that induce lactic acidosis on HIV patients.

II. METHODOLOGY

Two instruments were used to collect triangulated data namely questionnaires and interviews. Purposive sampling was used to find out

the most common types of ARV drugs used and types of foods taken. Questionnaires consisting of both closed and open ended questions were used. The study was conducted with 20 people who were HIV positive and receiving ARVs at a local health centre (Mkoba 13 Polyclinic Gweru). The survey focused on obtaining data on respondents' demography, types of ARV drug combinations and their side effects and dietary regimen.

III. RESULTS

3.1 Drugs taken by respondents

Table 1 shows the drug combination taken by the HIV patients. Antiretroviral drug combination of lamivudine, stavudine and nevirapine was the most common drug administered (80% respondents). Only 5% of the respondents were taking ritonavir, lamivudine and nevirapine due to development of lactic acidosis. The other 15% were not yet on ARVs drugs but taking cotirmoxazole prophylaxis because they were still under CD4 count monitoring.

Table 1: Drugs taken by HIV respondents

| Drug combination | Respondents (%) |
|-----------------------------------|-----------------|
| lamivudine, stavudine, nevirapine | 80 |
| ritonavir, lamivudine, nevirapine | 5 |
| cotirmoxazole prophylaxis | 15 |

Fig. 1 shows that most (80%) of the respondents take drugs after a meal. Only 3 (15%) people took drugs on empty stomach and 5% after eating a non fat snack. ARV tablets containing stavudine could be tolerated on an empty stomach but those taking ritonavir could not since it causes nausea. All the respondents did not take high energy meals since they are potentially lactic acidosis inducing.

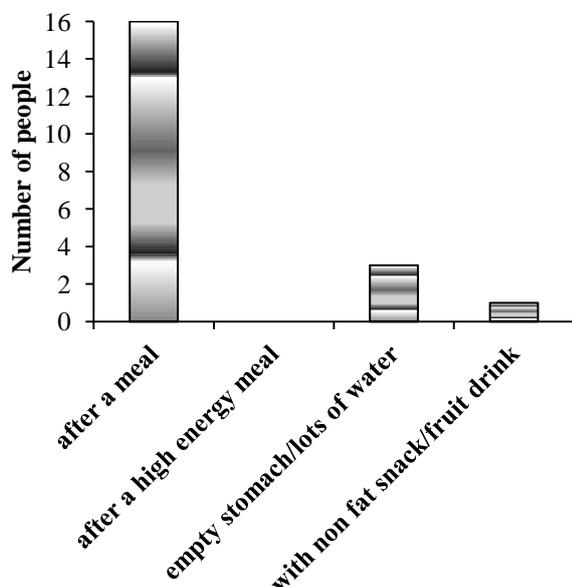


Figure 1: Meals consumed by HIV respondents before taking ARVs tablets.

3.2 ARVs Symptoms

ARV drugs cause adverse effects after taking them. Of the 20 HIV positive respondents 60% experienced symptoms of either feeling very weak and tired, weakness in arms and legs and nausea, shortness in breathe and nausea while 40% of the respondents did not experience any symptom. Not all the respondents experience symptoms of lactic acidosis. According to Devlin [2], people taking ARV drug combination with stavudine may not develop problems associated with lactic acidosis. Fig. 2 shows the frequency of the symptoms that were experienced by 12 of the respondents after taking ARV medication. Some respondents indicated more than one symptom. Nine respondents felt weak and tired, 6 experienced weakness in arms and legs and 1 respondent experienced nausea.

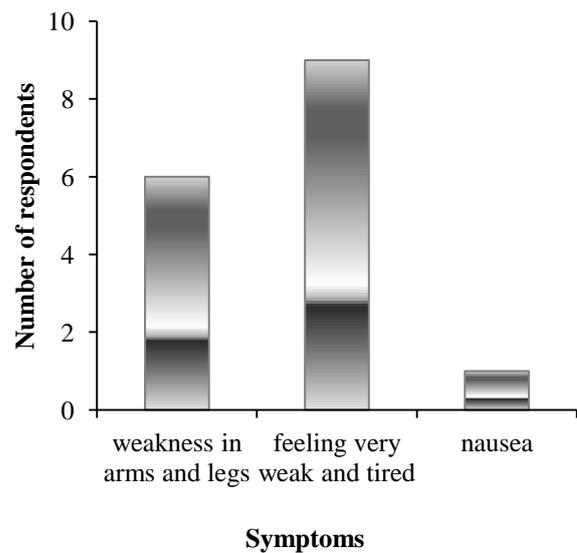


Figure 2: Frequency at which symptoms were experienced after taking ARVs.

3.3 Dietary regimen

3.3.1 Meals taken per day by the respondents

Most of the respondents had at least three meals per day. 2 out of 20 of the respondents had two meals per day, 9 had three meals and the remainder had more than three meals a day. Table 2 shows the nutritional value as an index of biological value of the foods taken at breakfast, lunch and supper. At breakfast 35% of the respondents (n=20) had a balanced diet with high biological value (HBV) proteins from animal sources such as eggs and beef. 25% had low biological value (LBV) proteins from vegetable sources such as cowpeas and sugar beans. 40% of the respondents did not have a balanced diet which was protein deficient and rich in carbohydrates. Tea with sugar was commonly taken at breakfast. Sugary foods are not recommended to HIV positive people who are prone to lactic acidosis. Eating sugary foods tends to increase glucose levels in the body resulting in conversion of glucose to

lactic acid under conditions of limited oxygen supply [10].

At lunch 50% of respondents did not have a balanced diet (protein deficient and carbohydrate dense). 50% had a balanced diet of which 90% of this population had HBV protein (beef, roasted termites and fish) and 10% LBV proteins (beans). The negative economic effects were clearly shown at breakfast and lunch since most of the respondents were concerned about filling up the stomach without considering nutrients required by the body.

During supper 90% of the respondents had a balanced diet with HBV protein and this can be attributed to supper being considered as the most important meal of the day. 5% had LBV protein and the other 5% did not have a balanced diet during supper.

Green leafy vegetables were the common source of minerals, vitamins and roughage. 16 out of the 20 respondents included vegetables in their diet, 2 included fruits in their servings and 2 respondents lacked both fruits and vegetables in their diets. Fruits are recommended in HIV people since they provide micronutrients that are needed for metabolism of fats, carbohydrates and proteins. Eating fruits that contain zinc such as avocado, pears and paw-paws improves white cell counts and antibody production. Zinc may reduce symptoms of lactic acidosis and rheumatoid arthritis [17]. Fruits also provide vitamins that support drug detoxification and reduce ARV drug after effects such as nausea, exhaustion, loss of appetite and impairment of immune response. 17 out of the 20 respondents used cooking oil for preparing meals, Only 3 respondents used fats as spread such as butter, margarine and peanut butter since consuming too much fat might result in

Table 3: The dietary regimen that the researcher recommends for people who are HIV positive.

| Day | Breakfast | Mid morning | Lunch | Afternoon tea | Supper |
|-----|---|----------------------------------|---|------------------------------------|--|
| 1 | Millet porridge with peanut butter, boiled milk, orange juice, pawpaw juice | Potato broth, avocado, mealies | Unpolished rice, fresh vegetable salad, pumpkin | Guavas, potato chips, roasted nuts | Lean meat, covo, fish fillets, mashed potato |
| 2 | Mealie meal porridge with wheat bran, guava juice | Herbal tea, 3 slices of bread | Sadza, Beef stew, madora | Avocado, pineapple juice | Rice with peanut butter |
| 3 | Sorghum porridge with peanut butter, orange juice | Mashed pumpkin, yoghurt | Potatoes, spinach | Pineapple juice, mealies | Sorghum Sadza, rape, mushroom |
| 4 | Sour porridge, pawpaw juice | Lemon grass tea, millet, muffins | Rice, fish fillet | Roasted nut, pear | Macaroni, vegetable salad, gravy |
| 5 | Millet porridge, boiled milk | Potato broth, pawpaw | Sadza, kapenta fish | Fruit salad, ice cream | Potatoes, dumplings, lean meat stew |
| 6 | Cerevita, pineapple juice | Butternut, fruit salad | Rice, chicken | Potato crisp, milk shake | Mashed butternut, broccoli |
| 7 | Mealie-meal milk porridge, guava juice | Green mealies | Potatoes, termites, carrot soup | Nuts, banana | Sorghum Sadza, spinach |

4 CONCLUSIONS

diarrhoea. 45% of respondents consumed acid forming foods such as maheu, yoghurt, and tea with sugar while 55% avoided such foods. Acid forming foods aggravate the development of lactic acidosis.

Table 2: Nutritional value of meals

| Meal | Nutritional value of a meal | | |
|-----------|-----------------------------|-----|------------|
| | HBV | LBH | Unbalanced |
| Breakfast | 7 | 5 | 8 |
| Lunch | 9 | 1 | 10 |
| Supper | 18 | 1 | 1 |

3.4 Weight of respondents

80% of the respondents weighed between 52 and 62 kg. This could be attributed to the fact that once people are on ARV drugs, it is recommended that they should not be overweight to avoid drug side effects. Another factor could be due harsh economic conditions.

3.5 Knowledge of respondents on diet

5% of the respondents had limited knowledge of suitable diet to follow. Although respondents received counseling sessions on appropriate diets to follow, some did not have adequate knowledge on nutrition in terms of amounts, allergies and intolerance of certain foods by individuals. It was evident from the results that people who are HIV positive were not given the recommended intake of essentials. A seven day dietary regimen cycle for HIV positive people was then recommended (Table 3). The suggested diet was based on digestibility of foods and reaction of different foods to ARVs. It was also recommended that respondents need to have regular light exercises.

This study has shown that certain ARV drug combination and unbalanced diet cause lactic acidosis. Nutritionists and dieticians need to produce and distribute materials that give information on recommended dietary menu plans for HIV positive people on ARVs. There is need for creation of income generating projects that target HIV positive people who are less fortunate to ensure adequacy of food supply in their homes. There is need to include in the health profession pre service curriculum information on available HIV/AIDS medication, side effects and its alleviation, counseling and testing skills. Counseling needs to be individualized and supported with practical written guidelines of nutrients and drug interactions. Future studies on the effectiveness of the recommendations in alleviating lactate acidosis need to be carried out.

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REFERENCES

- [1] A. Arenas-Pinto, A .D. Grant, S. Edwards and I.V.D. Weller, Lactic acidosis in HIV infected patients: a systematic review of published cases, *Sexually Transmitted Infections*, 79, 2003, 340-343.
- [2] T.M. Devlin, *Biochemistry with clinical correlations*, (Pennsylvania: John Wiley and Sons, 1986).
- [3] D.S. Fraley, S. Adler, F.J. Bruns, and B. Zett, Stimulation of lactate production by administration of bicarbonate in a patient with a solid neoplasm and lactic acidosis, *New England Journal of Medicine*, 303, 1980 303:1100-1111.
- [4] G. Friedman, G. Berlot, R.J. Kahn and J. Vincent, Combined measurements of blood lactate concentrations and gastric intramucosal pH in patients with severe sepsis, *Critical Care Medicine*, 3(7), 1995, 1184-1193.
- [5] G.M. Glew, *Biochemistry a clinical approach*, (Pennsylvania: John Wiley and Sons, 1996).
- [6] H. Silverman, *Food nutrition health*, (Oxford: Symour Press Ltd, 1992).
- [7] R.M .Granich, C.F. Gilks, C. Dye, K. M. De Cock and B.G. Williams, Universal voluntary HIV testing with immediate antiretroviral therapy as a strategy for elimination of HIV transmission: a mathematical model, *The Lancet*, 373, 2009, 48-57.
- [8] Z. Buttler, *Fundamentals of diet and nutrition*, (Oxford: McCrawhill., 1999).
- [9] C. Walsek, M. Zafonte and J.M. Bowers: Nutritional issues and HIV/AIDS: Assessment and treatment strategies, *Journal of the Association of Nurses in AIDS Care*, 8(6), 1997, 71-80.
- [10] T.M. Wolever and D.J. Jenkins, The use of the glycemic index in predicting the blood glucose response to mixed meals, *American Journal of Clinical Nutrition*, 43(1), 1986, 167-172.
- [11] B.A. Mizock, Lactic acidosis in critical illness, *Critical care medicine*, 20(1), 1992, 203-210.
- [12] A. Doyle, *Food toxicology and chemistry*, Oxford: University Press, 1996.
- [13] S. Hopewood, *Advanced food science*, (New York: Macmillan Publishing Company, 1999).
- [14] S. Salpeter, E. Greyber, G. Pasternak and E. Salpeter, Risk of fatal and nonfatal lactic acidosis with metformin use in type 2 diabetes mellitus, *Cochrane Database of Systematic Reviews*, 2006, 2967-2979.
- [15] E.M. Sillos, J.L. Shenep and G.A. Burghen, Lactic acidosis: a metabolic complication of hematologic malignancies: case report and review of the literature, *Cancer*, 92, 2001, 2237-2248.
- [16] A.S. Friedenber, D.E. Brandoff, F.J. Schiffman, Type B lactic acidosis as a severe metabolic complication in lymphoma and leukemia: a case series from a single institution and literature review, *Medicine (Baltimore)*, 86, 2007, 225-237.
- [17] K. Sriram and V.A. Lonchyna, Micronutrient supplementation in adult nutrition therapy: practical considerations, *Journal of Parenter and Enteral Nutrition*, 33(5), 2009, 548-562.