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## ORIGINAL ARTICLE

# Association between breakfast skipping and adiposity status among civil servants in the Tamale metropolis

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Breakfast meal contributes at least 25% of the daily requirements of an individual making it crucial for healthy growth and development. The aim of this study was to assess breakfast skipping and its association to adiposity among civil servants in the Tamale metropolis. A cross-sectional design was used to assess a sample of 235 civil servants working in the Tamale metropolis. Breakfast eating patterns were assessed by means of a questionnaire that was self-administered. Breakfast consumption was classified into breakfast eaters and skippers. Weight and height was measured to determine participants' adiposity status by means of body mass index cut-off points. Participants were within the age range of 20-60 years. Approximately half of the studied population (50.6%, n=119) were within the 20 - 29 age group. Among the studied population, 52.3% of the participants were breakfast eaters while 47.7% were breakfast skippers. More female participants skipped breakfast (57.8%; n= 52; p=0.016) as compared to males. Almost 30% (33/112) of the studied participants skipped breakfast for lack of time, 32.1% (36/112) for no appetite and 29.5% (33/112) for not feeling hungry. Breakfast skippers were significantly more likely to be overweight (57.3% vs. 42.6%) and obese (59.7% vs. 40.3%) compared to breakfast eaters. Skipping of breakfast was associated with obesity. Health strategies should be put in place by the Ghana Health Service to encourage individuals to regularly eat breakfast.

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**Keywords:** Adiposity, BMI, Breakfast Consumption, Breakfast skipping, Civil servants, Tamale, Ghana

### INTRODUCTION

Breakfast is crucial to all humans since it is the first meal of the day. It contributes to at least 25% of the daily nutritional requirements of an individual. Consumption of breakfast is essential for cognitive development and performance, as well as healthy growth for both children and adults (Croll *et al.*, 2001; Nicklas *et al.*, 2004; Pollitt *et al.*, 1998; Ramper-saud *et al.*, 2005). Healthy breakfast eating contributes to an overall sense of well-being and is important in preventing a number of diseases (Kushi *et al.*, 2006).

Some individuals perceive breakfast to be less important and time wasting, and thus skip it. This com-

pels them to binge during lunch and supper or snack in between meals predisposing them to obesity. Cross-sectional studies have shown that breakfast skipping is associated with increased prevalence of overweight and obesity (Croezen *et al.*, 2009; Dubois *et al.*, 2009; Ma *et al.*, 2003; Marin-Guerrero *et al.*, 2008). The consumption of breakfast is associated with lower risk of weight gain (Cho *et al.*, 2003). Research has shown that subjects who regularly skipped breakfast had 4.5 times risk of developing obesity than those who consumed breakfast regularly (Mota *et al.*, 2008). However, contradictory findings have also been reported on the association of breakfast skipping to body mass index (BMI) (Williams, 2007) or to overweight/obesity (Mota *et al.*, 2008).

Over 30% of civil servants in Ghana have been found to be either overweight or obese in recent times (Aryeetey *et al.*, 2011; Mogre *et al.*, 2012). Sed-

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entary lifestyles, urbanization and nutritional transition (Aryeetey *et al.*, 2011; Popkin *et al.*, 1998) have been attributed to the current situation. Furthermore, there is paucity of data on breakfast consumption patterns of Ghanaians. This study investigated the prevalence of breakfast skipping and its association to adiposity status among civil servants in Tamale, Ghana.

## MATERIALS AND METHODS

### Participants

This cross-sectional study was conducted between January and July, 2011. Participants comprised 235 adult civil servants within the Tamale Metropolis of the Northern Region of Ghana. All personnel from the 13 civil service departments in the Tamale Metropolis were eligible to participate in the study. Participants who were on medication known to modify serum lipid or carbohydrate metabolism were excluded from the study. Participants were selected using a proportionate random sampling technique that included more participants from larger departments, with the help of random number statistical tables. From each department, a proportionately determined number of participants were selected from the list of potential participants in that department. The inclusion of participants was voluntary and informed consent was obtained from each participant. The study was approved by the Ethics Committee of the University for Development Studies, School of Medicine and Health Sciences.

### Anthropometric variables

Anthropometric measurements such as height and weight were taken. The weights of subjects were measured to the nearest 0.1 kg using the UNICEF electronic scale manufactured by SECA. All scales used were calibrated with a standard weight prior to use. The heights of participants without shoes on were measured using a wall-mounted microtoise calibrated to the nearest 0.1 m. The adiposity status of participants was determined using Body Mass Index (BMI) which was obtained by dividing their weights in kilogram (kg) by the square of their heights in metres (m). The WHO normative standards for the adult classification of body weight were followed in which underweight was considered to be a BMI <

18.5 kg/m<sup>2</sup>, normal weight: BMI 18.5–24.9 kg/m<sup>2</sup>, overweight (pre-obese): BMI 25–29.9 kg/m<sup>2</sup> and Obese: BMI > 30 kg/m<sup>2</sup> (WHO, 2000)

### Breakfast eating patterns

A semi-structured, self-administered, 25-item questionnaire was employed to assess socio-demographic data and breakfast eating patterns. Breakfast was defined as “the first meal of the day that was taken in the morning, before going to work or at the workplace before 12:00 pm (Gajre *et al.*, 2008)”. The breakfast eating patterns of participants were classified into breakfast eaters and breakfast skippers. Breakfast eaters were participants who ate breakfast at least 4 days in a week. Breakfast skippers were participants who skipped breakfast at least 4 days in a week. Type of breakfast consumed by participants was classified into “light” breakfast and “heavy” breakfast. Light breakfast included food considered to be low in energy e.g. tea, coffee, vegetables and fruits. Heavy breakfast included high energy foods such as rice and beans (Waakyee), Tuo-zaafi, Banku and Kenkey.

### Statistical Analysis

The results were expressed as proportion and compared using Fischer’s exact test. A p-value of <0.05 was considered as statistically significant. GraphPad Prism version 5.00 (GraphPad software, San Diego California USA, [www.graphpad.com](http://www.graphpad.com)) for windows was used for all statistical analysis.

## RESULTS

Table 1 indicates the general characteristics of the studied population stratified by gender. This comprised of 145 males and 90 females with ages ranging between 20 to 60 years. Approximately half of the studied population (50.6%, n=119) were within the 20 - 29 age group. Among the studied population, 52.3% of the participants were breakfast eaters while 47.7% were breakfast skippers. More female participants skipped breakfast (57.8%; n= 52; p=0.016) as compared to males.

Among the breakfast skippers, 29.5% (33/112) skipped breakfast for lack of time, 32.1% (36/112)

for no appetite and 29.5% (33/112) for not feeling hungry. When reasons for skipping breakfast were stratified by gender however, the differences were not significant.

Table 2 assesses participant’s knowledge on the

health benefits of breakfast consumption in which 64.7% said the consumption of breakfast provides one with energy and 8.9% said the consumption of breakfast prevents one from getting ulcer. A few respondents 11.5% (27/235) said they did not have any knowledge on the health benefits of breakfast

**Table 1: General characteristics of the studied population**

Variable	Total (n = 235)	Male (n= 145)	Female (n= 90)	P value
<b>Age (years)</b>				
20-29	119 (50.6%)	70 (48.2%)	49 (54.4%)	0.421
30-39	61 (26.0%)	41 (28.3%)	20 (22.2%)	0.359
40-49	26 (11.1%)	14 (9.7%)	12 (13.3%)	0.399
50-59	25 (10.6%)	17 (11.7%)	8 (8.9%)	0.664
60+	1 (0.4%)	1 (0.7%)	0 (0.0%)	1.000
<b>Breakfast eating patterns</b>				
Breakfast Eaters	123 (52.3%)	85 (58.6%)	38 (42.2%)	0.016
Breakfast Skippers	112(47.7%)	60(41.4%)	52(57.8%)	
<b>Participants’ reasons for Skipping breakfast</b>	<b>n = 112</b>	<b>n = 60</b>	<b>n = 52</b>	
Lack of time	36 (32.1%)	22 (36.7%)	14 (26.9%)	0.314
Lack of appetite	33 (29.5%)	20 (33.3%)	13 (25.0%)	0.408
Not feeling hungry	33 (29.5%)	20 (33.3%)	13 (25.0%)	0.408
Too early to eat	5 (4.5%)	3 (5.0%)	2 (3.8%)	0.622
Religious reasons	3 (2.7%)	2 (3.3%)	1 (1.9%)	1.000
Health Reasons	2 (1.8%)	2 (3.3%)	0 (0.0%)	0.498

**Data was presented as proportion and analyzed using Fischer’s exact test**

consumption. There was no significant difference when the participant’s knowledge on the health benefits of breakfast consumption was stratified based on gender.

Majority of the breakfast eaters took light food (71.5%) largely within the hour of 4-8 am (59.3%) as shown in Table 2. The estimated mean BMI was 27.7 kg/m<sup>2</sup>, with the mean BMI of males being 26.9 kg/m<sup>2</sup> and 29.1 kg/m<sup>2</sup> for female participants. The prevalence of obesity was 28.5% (67/235) and high-

er (p=0.017) in females (37.8%) than in males (22.8%).

The comparison between breakfast eating patterns, remedy for skipping breakfast and body weight are presented in Figure 1. Participants who skipped breakfast were significantly more likely to be overweight (57.3% vs. 42.6%) and obese (59.7% vs. 40.3%) compared to participants who ate breakfast. With regards to remedy for skipping breakfast, participants who snacked were significantly more likely

**Table 2: General Characteristics of the studied population**

Variable	Total (n = 235)	Male (n= 145)	Female (n= 90)	P value
<b>Knowledge on the health benefits of breakfast (n = 235)</b>				
Has no idea	27 (11.5%)	17 (11.7%)	10 (11.1%)	1.000
Gives me energy and boost attention	152 (64.7%)	94 (64.8%)	58 (64.4%)	1.000
Promotes good health and development	35 (14.9%)	22 (15.2%)	13 (14.4%)	1.000
Prevents Ulcer	21 (8.9%)	13 (9.0%)	8 (8.9%)	1.000
<b>Kind of breakfast taken (n = 123)</b>				
Light	88 (71.5%)	60 (70.6%)	28 (73.7%)	0.830
Heavy	35 (28.5%)	25 (29.4%)	10 (26.3%)	
<b>Time of breakfast (n = 123)</b>				
4am-8am	73 (59.3%)	50 (58.8%)	17 (44.7%)	0.173
8am-12pm	50 (40.7%)	35 (41.2%)	21 (55.3%)	
<b>Adiposity status (n = 235)</b>				
Normal	67 (28.5%)	46 (31.7%)	21 (23.3%)	0.183
Overweight	101 (43.0%)	66 (45.5%)	35 (38.9%)	0.345
Obesity	67 (28.5%)	33 (22.8%)	34 (37.8%)	0.017

**Data was presented as proportion and analyzed using Fischer’s exact test**

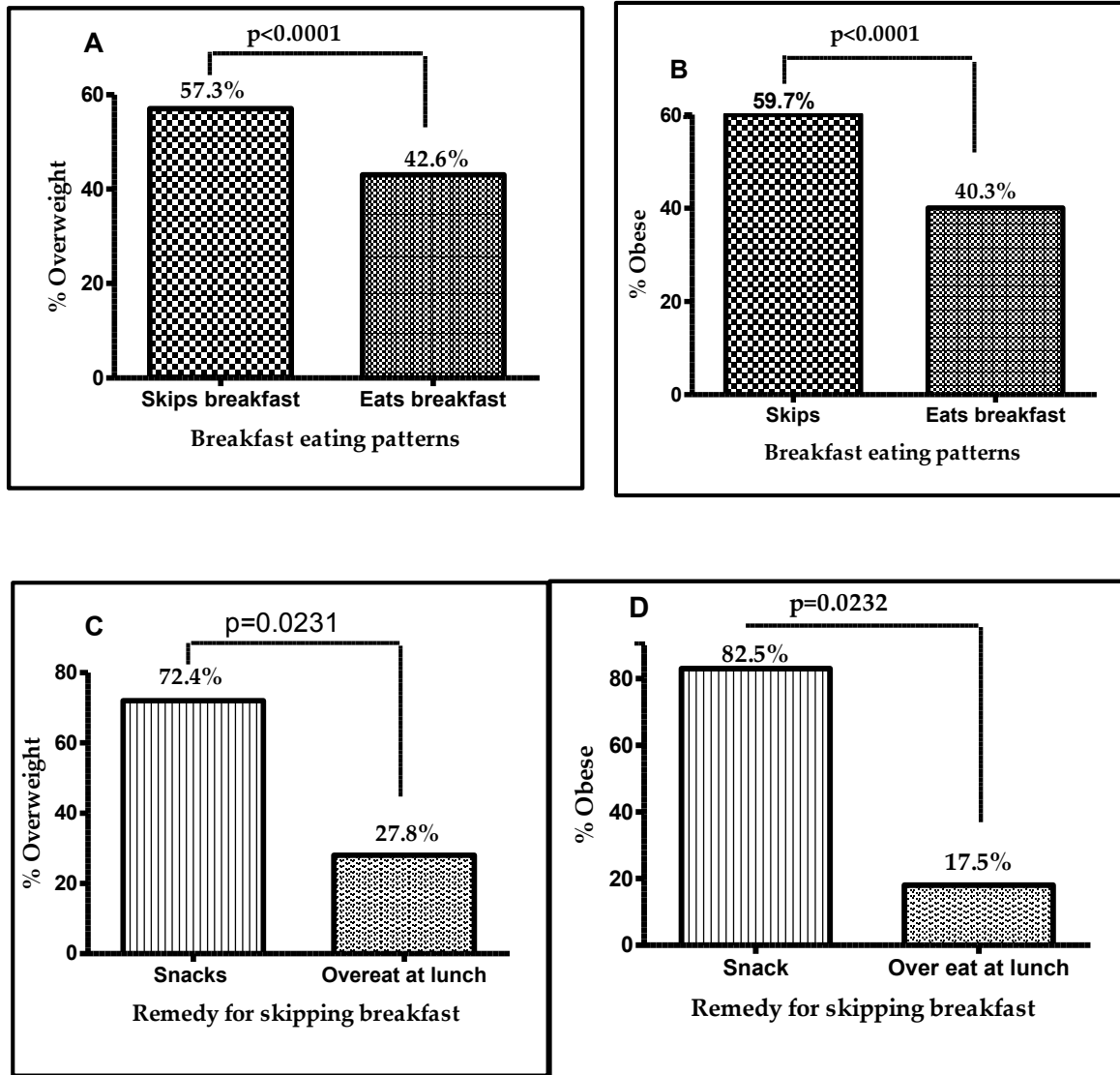
to be overweight and obese compared to those who overeat during lunch ( $p=0.0232$ ).

**DISCUSSION**

From this study, 47.7% of the studied participants skipped breakfast. Although the range of definitions used for breakfast skipping as well as the paucity of data in Sub-Saharan Africa may complicate comparisons, the rate of breakfast skippers in this study is among the highest reported in literature. A study among Taiwanese adults estimated a breakfast skipping rate of 8% (Huang *et al.*, 2010). In a study of free living adults in the US, 20.05% skipped breakfast (Mezrich *et al.*, 2003). Another survey in Finland reported a breakfast skipping rate of 40.2% and 29% in men and women respectively (Keski-Rahkonen *et al.*, 2003). About 30% of breakfast skipper’s did not eat breakfast because of lack of time, appetite or not feeling hungry. These reasons coincide with several other studies in adults (Letsa, 2011; Moy *et al.*, 2009; Nicklas *et al.*, 2004). The observed 52.3% breakfast eaters from this study is in agreement with the 53% observed among an adult population in Turkey

(Memis *et al.*, 2010) and the 51.2% and 48.8% reported in Taiwanese men and women respectively (Huang *et al.*, 2010).

Another important finding from this study is the higher rate of obesity among breakfast skippers as compared to the breakfast eaters. These results are in agreement with data from Spanish adults (Marin-Guerrero *et al.*, 2008); Taiwanese (Huang *et al.*, 2010) and several other populations where skipping breakfast has been associated with a higher BMI and obesity (Cho *et al.*, 2003; Keski-Rahkonen *et al.*, 2003; Ma *et al.*, 2003). Also, the prevalence of obesity was found to be higher among females as compared to the male participants. This could probably be attributed to the findings that more females skipped breakfast, which has been shown to be associated with obesity in this study. Data on breakfast skipping and obesity in sub-Saharan Africa is limited, however; studies in developed countries have shown a decreasing trend in breakfasting but an increasing trend in the prevalence of obesity (Kant *et al.*, 2006). It is therefore not surprising that



**Figure 1:** Comparison between breakfast eating patterns and overweight (A), between breakfast eating patterns and Obesity (B), between remedy for skipping breakfast and overweight (C) and between remedy for skipping breakfast and obesity (D). Data was analyzed using Fischer's exact test.

a high prevalence of 28.5% of obesity have been found in this study with a breakfast skipping prevalence of 47.7%. Promotion of regular breakfast consumption should be included in the development of programmes to address obesity.

It is unclear the mechanisms by which breakfast skipping contributes to the development of obesity

from this study. However, several potential mechanisms have been suggested including decreased energy expenditure, increased daily total energy intake and increased energy storage (Gwinup *et al.*, 1963; Jenkins *et al.*, 1989; Wadhwa *et al.*, 1973; Young *et al.*, 1972).

One limitation of this study is that it did not consider other factors such as physical activity levels, total daily energy intake and dieting that are known to influence body weight. However, the study has demonstrated an association between breakfast skipping and BMI status.

## CONCLUSION

The prevalence of both overweight and obesity was higher in breakfast skippers than in breakfast eaters. Female participants were more likely to skip breakfast and more likely to be obese than their male participants. Further research is needed to determine whether breakfast skipping has a causal relation to overweight and obesity. Family health promotion strategies should be put in place by the health authorities to encourage individuals to eat breakfast regularly to help reduce the high prevalence of obesity.

## COMPETING INTERESTS

The authors declare that they have no competing interests.

## REFERENCES

- Aryeetey, R, Ansong, J (2011) Overweight and hypertension among college of health Sciences employees in Ghana. *Africa Journal of Food, Agriculture and Nutrition and Development* 11(6): 5444-5456.
- Cho, S, Dietrich, M, Brown, CJ, Clark, CA, Block, G (2003) The effect of breakfast type on total daily energy intake and body mass index: results from the Third National Health and Nutrition Examination Survey (NHANES III). *J Am Coll Nutr* 22(4): 296-302.
- Croezen, S, Visscher, TL, Ter Bogt, NC, Veling, ML, Haveman-Nies, A (2009) Skipping breakfast, alcohol consumption and physical inactivity as risk factors for overweight and obesity in adolescents: results of the E-MOVO project. *Eur J Clin Nutr* 63(3): 405-412.
- Croll, JK, Neumark-Sztainer, D, Story, M (2001) Healthy eating: what does it mean to adolescents? *J Nutr Educ* 33(4): 193-198.
- Dubois, L, Girard, M, Potvin Kent, M, Farmer, A, Tatone-Tokuda, F (2009) Breakfast skipping is associated with differences in meal patterns, macronutrient intakes and overweight among pre-school children. *Public Health Nutr* 12(1): 19-28.
- Gajre, NS, Fernandez, S, Balakrishna, N, Vazir, S (2008) Breakfast eating habit and its influence on attention-concentration, immediate memory and school achievement. *Indian Pediatr* 45(10): 824-828.
- Gwinup, G, Byron, RC, Roush, WH, Kruger, FA, Hamwi, GJ (1963) Effect of Nibbling Versus Gorging on Serum Lipids in Man. *Am J Clin Nutr* 13: 209-213.
- Huang, CJ, Hu, HT, Fan, YC, Liao, YM, Tsai, PS (2010) Associations of breakfast skipping with obesity and health-related quality of life: evidence from a national survey in Taiwan. *Int J Obes (Lond)* 34(4): 720-725.
- Jenkins, DJ, Wolever, TM, Vuksan, V, Brighenti, F, Cunnane, SC, Rao, AV, Jenkins, AL, Buckley, G, Patten, R, Singer, W, et al. (1989) Nibbling versus gorging: metabolic advantages of increased meal frequency. *N Engl J Med* 321(14): 929-934.
- Kant, AK, Graubard, BI (2006) Secular trends in patterns of self-reported food consumption of adult Americans: NHANES 1971-1975 to NHANES 1999-2002. *The American journal of clinical nutrition* 84(5): 1215-1223.
- Keski-Rahkonen, A, Kaprio, J, Rissanen, A, Virkunen, M, Rose, RJ (2003) Breakfast skipping and health-compromising behaviors in adolescents and adults. *Eur J Clin Nutr* 57(7): 842-853.
- Kushi, LH, Byers, T, Doyle, C, Bandera, EV, McCullough, M, McTiernan, A, Gansler, T, Andrews, KS, Thun, MJ (2006) American Cancer Society Guidelines on Nutrition and Physical Activity for cancer prevention: reducing the risk of cancer with healthy food choices and physical activity. *CA Cancer J Clin* 56(5): 254-281; quiz 313-254.
- Letsa, WC (2011) Importance of Breakfast to the Business Executive. In: *The Mirror*, p 10. Accra.
- Ma, Y, Bertone, ER, Stanek, EJ, 3rd, Reed, GW, Hebert, JR, Cohen, NL, Merriam, PA,

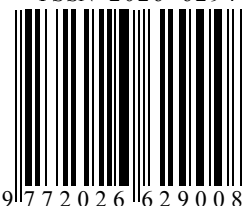
## Relation between breakfast and body weight

Mogre et al.,

- Ockene, IS (2003) Association between eating patterns and obesity in a free-living US adult population. *Am J Epidemiol* 158(1): 85-92.
- Marin-Guerrero, AC, Gutierrez-Fisac, JL, Guallar-Castillon, P, Banegas, JR, Rodriguez-Artalejo, F (2008) Eating behaviours and obesity in the adult population of Spain. *Br J Nutr* 100(5): 1142-1148.
- Memis, E, Sanlier, N (2010) Analysis of Nutrition Habits of the Teachers and Nurses. *Pakistan Journal of Nutrition* 9(12): 1176-1182.
- Mezrich, JD, Yamada, K, Lee, RS, Mawulawde, K, Benjamin, LC, Schwarze, ML, Maloney, ME, Amoah, HC, Houser, SL, Sachs, DH, Madsen, JC (2003) Induction of tolerance to heart transplants by simultaneous cotransplantation of donor kidneys may depend on a radiation-sensitive renal-cell population. *Transplantation* 76(4): 625-631.
- Mogre, V, Mwinlenaa, PP, Oladele, J, Amalba, A (2012) Impact of physical activity levels and diet on central obesity among civil servants in Tamale metropolis. *Journal of Medical and Biomedical Sciences* 1(2).
- Mota, J, Fidalgo, F, Silva, R, Ribeiro, JC, Santos, R, Carvalho, J, Santos, MP (2008) Relationships between physical activity, obesity and meal frequency in adolescents. *Ann Hum Biol* 35(1): 1-10.
- Moy, FM, Johari, S, Ismail, Y, Mahad, R, Tie, FH, Wan Ismail, WMA (2009) Breakfast Skipping and Its Associated Factors among Undergraduates in a Public University in Kuala Lumpur. *Mal J Nutr* 15(2): 165 - 174.
- Nicklas, TA, O'Neil, C, Myers, L (2004) The Importance of Breakfast Consumption to Nutrition of Children, Adolescents, and Young Adults. *Nutr Today* 39(1): 30-39.
- Pollitt, E, Mathews, R (1998) Breakfast and cognition: an integrative summary. *Am J Clin Nutr* 67(4): 804S-813S.
- Popkin, BM, Doak, CM (1998) The obesity epidemic is a worldwide phenomenon. *Nutr Rev* 56(4 Pt 1): 106-114.
- Rampersaud, GC, Pereira, MA, Girard, BL, Adams, J, Metz, JD (2005) Breakfast habits, nutritional status, body weight, and academic performance in children and adolescents. *J Am Diet Assoc* 105(5): 743-760; quiz 761-742.
- Wadhwa, PS, Young, EA, Schmidt, K, Elson, CE, Pringle, DJ (1973) Metabolic consequences of feeding frequency in man. *Am J Clin Nutr* 26(8): 823-830.
- WHO (2000) Obesity: preventing and managing the global epidemic, WHO (ed). Geneva: WHO.
- Williams, P (2007) Breakfast and the diets of Australian children and adolescents: an analysis of data from the 1995 National Nutrition Survey. *Int J Food Sci Nutr* 58(3): 201-216.
- Young, CM, Hutter, LF, Scanlan, SS, Rand, CE, Lutwak, L, Simko, V (1972) Metabolic effects of meal frequency on normal young men. *J Am Diet Assoc* 61(4): 391-398.



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## ORIGINAL ARTICLE

# Links among motivation, socio-demographic characteristics and low physical activity level among a group of Nigerian patients with type 2 diabetes

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While many studies blame low physical activity (PA) among patients with type 2 diabetes mellitus (T2DM) on lack of motivation, others have inconsistently linked it with socio-demographic characteristics. This study investigated the associations among motivation, socio-demographic characteristics and low level participation in physical activity among a group of Nigerian patients with T2DM. A consenting sample of 326 T2DM patients attending diabetes clinics of the two largest hospitals in Ibadan participated in this cross-sectional study. Motivation types and PA levels were assessed using the Motivation for Physical Activity Questionnaire and International Physical Activity Questionnaire respectively. Socio-demographic data were also documented. Regression analysis was used to determine associations at  $p < 0.05$ . A total of 245 (75.2%) of the participants were intrinsically motivated towards PA but only 108 (33.1%) were active at moderate-to-high levels. Motivation and duration of diagnosis were not linked with low PA while being female (OR=1.57; 95%CI =1.22-4.19), age > 60 (OR=2.42; 95%CI =1.91-3.77), no education (OR=2.21; 95%CI =1.64-4.33), retirement (OR=3.89; 95%CI =2.72-6.35) and being married (OR=1.63; 95%CI =1.14-3.66) conferred increased risks of low PA. The Nigerian T2DM patients were appropriately motivated but PA was below recommended levels. Low PA was significantly linked with more of the socio-demographic characteristics than motivational factors.

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**Keywords:** Type 2 diabetes; Physical activity; Motivation; Psychological factors; Physical exercise

## INTRODUCTION

A large number of individuals who present with chronic illnesses find it difficult to commence most of the healthcare habits that have been found to be beneficial to their overall health and when they are able to commence the activities, most of them find it difficult to maintain such habits (Amico, 2011). This assertion is also supported by Dunbar-Jacobe and Mortimer-Stephen (2011) who claimed that almost two thirds of persons with chronic illnesses do not follow their treatment prescriptions. One of the prescriptions in the line of management of these patients as shown by systematic reviews is the adoption of

regular physical activity at moderate intensities and this has been shown to reduce the risk of having type 2 diabetes mellitus (T2DM) (Jeon *et al.*, 2007).

Physical activity of moderate intensity for at least 150 minutes in a week or at least 90 minutes/week of vigorous aerobic exercise is recommended to enhance cardio-metabolic health of patients with T2DM (Sigal *et al.*, 2006). In spite of the benefits and the laid down prescriptions, most patients with diabetes are inconsistent with their physical activities (Mori *et al.*, 2011). Research findings have also indicated that physical activity is the least maintained of all the self-care efforts (Shigaki *et al.*, 2010). There appears to be a myriad of factors militating against the participation of patients with T2DM in regular physical activity and exercises. Some of the factors include lack of social support (Korkiakangas *et al.*, 2009; Adeniyi *et al.*, 2012), lack

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of knowledge of the types of exercise to perform, health problems, pain/difficulty taking part in exercise, lack of local exercise facilities, aversion to exercising in poor weather (Korkiakangas *et al.*, 2009) and a host of other socio-demographic factors (Barrett *et al.*, 2007; Morrato *et al.*, 2007; Huebschmann *et al.*, 2011). However, evidence has also consistently shown that motivation is an important factor in adhering to physical exercises among both healthy and chronically ill populations (Ryan and Deci, 2000; Trost *et al.*, 2004; Biddle and Nigg, 2000; Plotnikoff *et al.*, 2010; Shigaki *et al.*, 2010). This present study therefore presents the physical activity levels of a group of Nigerian patients with T2DM and describes how low physical activity level is associated with the socio-demographic characteristics of the patients and the type of motivation that is being exhibited by the patients.

## MATERIALS AND METHODS

### Study sites

Participants in this cross-sectional study were consenting patients with type 2 diabetes attending the diabetes clinics of the University College Hospital and Ring Road State Hospital, both in Ibadan, Nigeria. The University College Hospital, owned by the Federal Government of Nigeria is a tertiary health care provider and it is the teaching hospital for the training of medical and allied health students. It is also a postgraduate professional medical training centre for resident doctors and other healthcare professionals. The Ring Road State Hospital, owned by the Oyo State Government is a secondary health care provider and it also serves as a source of referral to the University College Hospital. Both hospitals run dedicated diabetes clinics on specific days of the week.

### Participants

The patients were selected based on pre-set criteria. The criteria included being in the age range of 15 to 69 years, having been diagnosed of T2DM for at least six months and without any known disorder or disability that may prevent them from undertaking regular physical activity. Patients who had advanced stage of diabetic foot ulceration, those who had lower limb amputations, those who were blind and

those who were instructed by their physicians to stay away from regular physical activity were excluded. A total of 326 out of the 418 patients receiving treatment in the two hospitals during the data collection period participated in the study. Ethical approval for the study was sought and obtained from the University of Ibadan/University College Hospital Research Ethics Committee (Protocol ID: UI/EC/12/0117).

### Procedure for questionnaire translation and data collection

The Motivation for Physical Activity Questionnaire, the International Physical Activity Questionnaire (IPAQ) as well as the questionnaire to document the socio-demographic characteristics of the participants was translated into Yoruba language using a forward-backward translation process. The translation process was undertaken for the benefit of Yoruba speaking participants who did not understand or speak English. Socio-demographic characteristics comprising age, sex, occupation, level of education and marital status were also documented.

### Assessment of motivation for physical activity

The Motivation for Physical Activity Questionnaire developed by Deci and Ryan was used to assess the motivation for physical activity among the T2DM patients (Deci and Ryan, 2004; Fitness Management, 2012). The questionnaire is a sixteen-item measure which was designed to classify patients' motivation for physical activity as either intrinsic or extrinsic using factors such as external regulation, introjected regulation, identified regulation, and intrinsic motivation to qualify the type of motivation that spurs the patient into physical activity. An average was taken for each of these factors and these averages were used to calculate the Relative Autonomy Index (RAI) which specifies if the patient is either intrinsically or extrinsically motivated for physical activity. If the value of RAI obtained is negative then, it shows the patient is extrinsically motivated. On the other hand, if the value of RAI calculated is positive then, it means the patient is intrinsically motivated. Intrinsic motivation is defined as the doing of an activity for its inherent

satisfactions rather than for some separable consequence while extrinsic motivation is a construct that pertains whenever an activity is done in order to attain some separable outcome (Ryan and Deci 2000). The RAI was calculated thus:

The RAI = External regulation x (-2) + Introjected regulation x (-1) + Identified regulation x (1) + Intrinsic motivation x (2) (Deci and Ryan, 2004; Fitness Management, 2012).

**Assessment of physical activity:** Physical activity was assessed using the International Physical Activity Questionnaire (IPAQ). The questionnaire is aimed at measuring health related physical activity levels in different populations as well as obtaining internationally comparable data on health-related physical activity. There are two forms of the questionnaire, the long and short forms. For this study, the short self-administered form of this questionnaire was used (International Physical Activity Questionnaire, IPAQ, 2012). It is made up of 7 items and 4 domains which cover domestic and yard gardening activity, transport-related activity, leisure time activity and work-related activity. It records the activity in four intensity levels namely vigorous-intensity activity, moderate-intensity activity, walking (low intensity activity) and sedentary. The validity of this instrument has been proven over time by a lot of researches including the 12-country reliability and validity test (Kurtze *et al.*, 2008). It has also been recommended as a cost effective method to assess physical activity (Lee *et al.*, 2011).

#### Data Analysis

Descriptive statistics of frequencies and percentages were used to summarize the data and are presented in tables and charts. Logistic regression analyses were carried out on the data of the participants who presented with low physical activity levels. In the analyses, the odds ratio and 95% confidence intervals for having low physical activity were determined based on motivation type, duration of diagnosis of diabetes and the socio-demographic characteristics. Level of significance was set at  $p < 0.05$ .

## RESULTS

### Socio-demographic characteristics

A total of 326 patients with T2DM participated in this survey. The mean age of the participants was  $53.8 \pm 7.4$  years and more than one third of the participants (38.3%) were in the age range of 60 to 69 years (Table 1). Female participants (56.1%) were more than the male participants and most of them were diagnosed within 10 years and below (mean duration of diagnosis =  $6.9 \pm 5.7$  years). Table 1 presents other data on level of educational attainment, occupation and marital status of the participants.

**Table 1: Descriptive characteristics of the participants**

Variable	Frequency (%)
<b>Age</b>	
< 40	26 (8.0)
40-49	81 (24.9)
50-59	94 (28.8)
60-69	125 (38.3)
<b>Sex</b>	
Male	143 (43.9)
Female	183 (56.1)
<b>Level of education</b>	
Primary level	54 (16.6)
Secondary level	76 (23.3)
Tertiary level	103 (31.6)
Postgraduate level	42 (12.9)
No formal education	51 (15.6)
<b>Occupation</b>	
Gainfully employed	177 (54.3)
Retiree	98 (30.1)
Unemployed	51 (15.6)
<b>Marital status</b>	
Single	11 (3.4)
Married	249 (76.4)
Widow/widower/separated	66 (20.2)
<b>Duration of diagnosis (in years)</b>	
$\leq 10$	207(63.5)
11-20	66 (20.2)
21-30	38 (11.7)
31-40	7 (2.1)
$\geq 41$	8 (2.5)

### Motivation and physical activity levels

The type of motivation for physical activity being exhibited by the participants is presented in Figure 1A. The figure shows that most of the participants (75.2%) were intrinsically motivated to participate in physical activity programmes, with only 81 (24.8%) of them exhibiting the extrinsic form of motivation. To compute the total scores for the short IPAQ a summation of the duration (in minutes) and frequency (in days) of walking, moderate-intensity and vigorous activities were carried out. The scores are expressed in Metabolic Equivalent (MET)-minutes/week and are defined as:

**walking MET-minutes/week** = 3.3 x walking minutes x walking days;

**moderate MET-minutes/week** = 4.0 x moderate intensity activity minutes x moderate days and

**vigorous MET-minutes/week** = 8.0 x vigorous intensity activity minutes x vigorous intensity days.

**Total physical activity MET minutes/week** = sum of walking + moderate + vigorous MET minutes/week scores.

The participants were categorized into three levels: *Category 1 (Low activity level)* means no activity was reported OR some activity was reported but not enough to meet categories 2 and 3. For *Category 2 (Moderate activity level)* means a) three or more days of vigorous-intensity activity of at least 20 minutes per day OR b) five or more days of moderate-intensity activity and/or walking of at least 30 minutes per day OR c) five or more days of any combination of walking, moderate-intensity or vigorous-intensity activities achieving a minimum total physical activity of at least 600 MET-minutes/week. In *Category 3 (High activity level)*, it is vigorous-intensity activity on at least three days, achieving a minimum total physical activity of at least 1500 MET-minutes/week OR seven or more days of any combination of walking, moderate-intensity or vigorous-intensity activities achieving a minimum total physical activity of at least 3000 MET-minutes/week (IPAQ, 2012). Figure 1B presents the physical activity levels of the participants. About two thirds of the participants (66.9%) presented with low physical activity levels while only 96 (29.4%) presented with moderate level of physical activity.

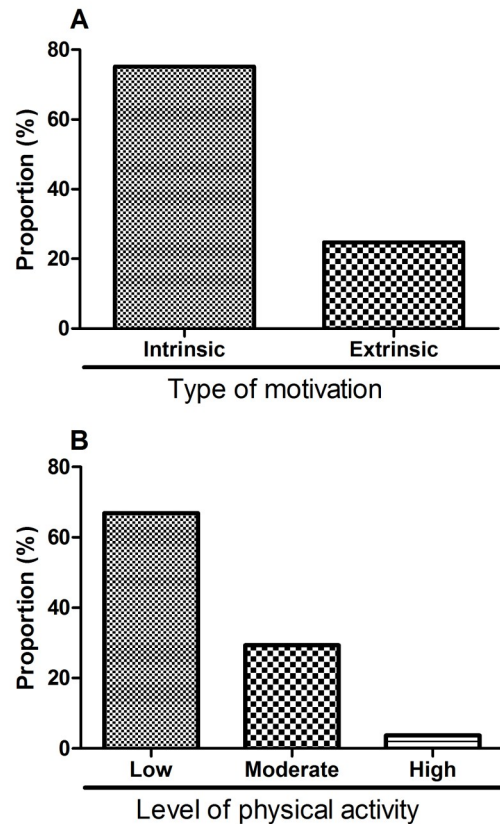


Figure 1: Types of motivation exhibited by the participants (A) as well as the levels of physical activity of participants (B).

### Association between physical activity and each of motivation and socio-demographic characteristics

As shown in table 2, being extrinsically motivated slightly increased the risk of having low physical activity level but this was not statistically significant (OR = 1.18; 95% CI = 0.71-1.36) for the group of patients that participated in this study. However, being 60 years and above showed the highest risk of low physical activity when compared with those who were younger than 40 years (OR = 2.42; 95% CI = 1.91-3.77). On the other hand, it was observed that having a tertiary level of education reduced the risk of low physical activity (OR = 0.52; 95% CI = 0.21-0.86) while lack of education increased the risk (OR = 2.21; 95% CI = 1.64-4.33). The duration of diagnosis did not significantly pre-

dict low level of physical activity, although those who were diagnosed 11 years and over were seen to have higher risk of low physical activity levels.

**Table 2: Odds Ratio and 95% confidence intervals of low physical activity level by motivation and socio-demographic characteristics**

Variable	Low physical activity n = 218 OR (95% CI)
<b>Motivation</b>	
Intrinsic	1
Extrinsic	1.18 (0.71, 1.36)
<b>Age (in years)</b>	
< 40	1
40-49	1.16 (0.87, 1.98)
50-59	1.55 (1.32, 1.85)*
> 60	2.42 (1.91, 3.77)*
<b>Sex</b>	
Male	1
Female	1.57 (1.22, 4.19)*
<b>Level of education</b>	
Primary level	1
Secondary level	0.83 (0.75, 1.44)
Tertiary level	0.52 (0.21, 0.86)*
No formal education	2.21 (1.64, 4.33)*
<b>Occupation</b>	
Gainfully employed	1
Retiree	3.89 (2.72, 6.35)*
Unemployed	2.15 (1.38, 4.28)*
<b>Marital status</b>	
Single	1
Married	1.63 (1.14, 3.66)*
Widow/widower/ separated	1.36 (1.11, 1.78)*
<b>Duration of diagnosis (in years)</b>	
≤ 10	1
≥ 11	1.29 (0.85, 1.41)

\*Significant at  $p < 0.05$

## DISCUSSION

This study was conducted to identify the level of physical activity among a group of Nigerian patients with T2DM and to know whether this was influenced by the type of motivational and socio-demographic characteristics that the participants presented with. The findings from this study showed that most of the participants presented with low level of physical activity notwithstanding the fact that most of them were intrinsically motivated towards physical activity. It was also observed that the low level of physical activity presented by this group of patients was not significantly linked with the type of motivation presented by the participants but was significantly linked with the socio-demographic characteristics.

Regular physical activity is generally known to benefit patients with T2DM and this has enjoyed a generous reportage from previously conducted studies. For instance, regular physical activity at moderate to vigorous levels is known to decrease rates of chronic disease and premature mortality (Sigal *et al.*, 2006; Centre for Disease Control and Prevention, CDCP 2008; O'Dougherty *et al.*, 2010). It is however noticed that most of the patients who took part in this study were yet to be physically active at recommended levels in spite of the large amount of evidence to this effect. This observation can be described as the general outlook of events among the general population of which T2DM patients are part of. It has been reported that despite an abundance of evidence surrounding the health benefits associated with physical activity, a large proportion of the adult population continue to lead sedentary and unhealthy lifestyles (O'Dougherty *et al.*, 2010; Caperchione *et al.*, 2012).

The fact that most of the patients presented with intrinsic motivation for physical activity as against extrinsic motivation was an exciting finding because it revealed that the patients were properly motivated to undertake physical activity for the benefit of their overall health. This observation might have originated from the fact that most of them had been diagnosed with T2DM for a few years, a situation that might have given them the opportunity to

develop the right motivation towards physical activity. During this period, the patients may have progressed from the pre-action stage of physical activity to the maintenance stage and specifically, individuals who progressed through these stages would have increased and maintained their levels of self-determined motivation (Fortier *et al.*, 2012).

That most of the participants were appropriately motivated to undertake physical activity without a proportionate increase in their physical activity level shows the likelihood of an action disconnect between motivation and the actual performance of the action. This shows that being motivated in itself may not be enough for the T2DM patients to be physically active and it means that some other factors apart from motivation could be responsible. The information-motivation-behavioural skills (IMB) model links performance of health behaviours to the extent to which someone is well informed about the behaviour, motivated to perform the behaviour and has the requisite skills to execute the behaviour (Osborn *et al.*, 2010). Applying the IMB model, the observation from this present study suggests that there is a problem at the motivation-behaviour inter-phase, with the behaviour in this case being the physical activity. It is not impossible that the socio-demographic characteristics of the participants had served as the moderating factors at this inter-phase.

The IMB model also considers information as vital in determining the behaviour of an individual. However, since the participants in this study demonstrated a high level of motivation, it can be fairly concluded that they were adequately informed because their motivation must have been driven by some information. Hence the need to explore other potential contributing factors. According to Egede and Osborn (2010), it is expected that one who is well informed and motivated to act is likely to develop the skills necessary to drive the behaviour and is likely to benefit maximally. A previous study among patients with diabetes had also reported a disconnection between the information about physical activity and the actual performance of the physical activity. According to a study by Lawton *et al.*, (2006), virtually all the respondents reported awareness about tak-

ing regular physical activity as part of diabetes care with most of them describing how they had been encouraged by health professionals to go out for regular walks and sometimes also to swim. However, whilst information about the need to undertake physical activity had clearly been received, only 21.8% of them claimed to have made a conscious and sustained effort to increase/maintain their physical activity (Lawton *et al.*, 2006). This also implies that some other factors apart from information may be responsible.

Whilst motivation type was not significantly linked, it was observed that the socio-demographic variables (age, sex, occupation, marital status and level of educational attainment) were individually linked significantly with low physical activity among the T2DM patients. The reasons for this observation may not be completely known, but it is possible that the socio-demographic characteristics compared to motivation exert more influence on the low level of physical activity of the T2DM patients making most of them present with low level of physical activity in spite of the appropriate motivation. The socio-demographic variables plausibly have authority over motivation when it comes to physical activity performance and may have contributed to the reasons why a number of studies have reported significant links between physical activity and socio-demographic characteristics. For instance, it was reported that men with T2DM participate in more leisure time physical activity than women do, and those from the highest income group participate in more activity than low- or middle- income groups (Barrett *et al.*, 2007; Huebschmann *et al.*, 2011), while patients with higher education were also reported to be more active (Morretero *et al.*, 2007).

The clinical application of this study lies in the fact that it has helped to show that the issue of motivation, undoubtedly very important among the plethora of reasons why patients with T2DM may not be physically active, may not be the most important barrier to be tackled when it comes to the task of making patients with T2DM from Nigeria to be more physically active. By this, it has helped to broaden the focus of physical activity experts on

what should be looked out for in patients with T2DM who are not physically active. The study further shows that the physical activity of this group of patients may be improved upon if some other factors other than amotivation are identified and given due considerations. With one major reason for physical inactivity now placed in proper perspectives, it will allow for more focus on how to tackle other likely reasons for physical inactivity among Nigerian patients. From this study and as previously observed by other studies, it appears that socio-demographic characteristics of the T2DM patients will need to be considered seriously if physical activity is to be improved. While it is certain that some of these socio-demographic variables such as age and sex are not modifiable, the idea is that, identifying patients based on these and other potential barriers will provide additional impetus to look closely into strategies of getting patients who fall into these categories to adopt recommended physically activity programmes.

This study has some shortcomings that are worthy of note. The study did not explore the roles of other potential moderators such as the psychosocial confounders. Physical activity of T2DM patients had been observed to be significantly influenced by a combination of psychosocial constructs including the social support, perceived barriers and self-efficacy (Adeniyi *et al.*, 2012). Also, this study did not assess depressive symptoms among the patients and this has been reported to impede self-care behaviours including physical activity (Shahar, 2008; Egede and Osborn, 2010). Because the study sample was hospital based, it is recommended that caution should be exercised in generalizing the findings as the participants in this study may not accurately represent the entire population of patients with diabetes who may not have presented in the hospitals. This is because unlike the non-hospital patients, the patients visiting the hospitals may have had access to a variety of health education on self-care efforts which may have influenced their motivation and physical activity levels. These weaknesses notwithstanding, the strength of this study lies in the fact it has shown the need to consider other factors in order to physi-

cally work up patients with T2DM even when they present with the appropriate motivations.

## CONCLUSIONS AND RECOMMENDATIONS

The Nigerian patients with T2DM are appropriately motivated to do physical activity but their physical activity is largely below recommended levels. Although motivation is very important when it comes to physical activity participation, this study has brought to the fore that there is also the need to look into other issues outside motivation, such as the socio-demographic characteristics of the patients with T2DM in order to achieve an increase in their physical activity to the recommended levels. Since physical activity level and all variables that influence participation are never static, the challenge is for the healthcare workers in this field to identify the dynamics of physical activity and inactivity as relates to many other aspects of life of a patient with T2DM. We recommend longitudinal studies that will look into the dynamism of the multiple life events of patients with T2DM in order to identify those that improve or reduce their physical activity levels.

## ACKNOWLEDGEMENT

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## COMPETING INTERESTS

The authors declare that they have no competing interests.

## REFERENCES

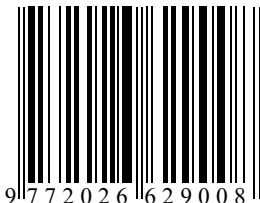
- Adeniyi, A.F., Idowu, O.A., Ogwumike, O.O., and Adeniyi, C.Y. (2012). Comparative influence of self-efficacy, social support and perceived barriers on low physical activity development in patients with type 2 diabetes, hypertension or stroke. *Ethiopian Journal of Health Sciences*, 22, 113-119.
- Amico, K.R. (2011). A situated-Information Motivation Behavioral Skills Model of care initiation and maintenance (sIMB-CIM): an

- IMB Model based approach to understanding and intervening in engagement in care for chronic medical conditions. *Journal of Health Psychology*, 16, 1071–1081.
- Barrett, J.E., Plotnikoff, R.C., Courneya, K.S., and Raine, K.D. (2007). Physical activity and type 2 diabetes: exploring the role of gender and income. *The Diabetes Educator*, 33, 128–143.
- Biddle, S.J.H., and Nigg, C.R. (2000). Theories of exercise behavior. *International Journal of Sport Psychology*, 31, 290–304.
- Caperchione, C.M., Vandelanotte, C., Kolt, G.S., Duncan, M., Ellison, M., George, E. et al. (2012). What a man wants: understanding the challenges and motivations to physical activity participation and healthy eating in middle-aged Australian men. *American Journal of Mens Health*, 6, 453–461.
- Center for Disease Control and Prevention (2008). 2008 Physical Activity Guidelines for Americans Fact Sheet for Health Professionals on Physical Activity Guidelines for Adults. [http://www.cdc.gov/nccdphp/dnpa/physical/pdf/PA\\_Fact\\_Sheet\\_Adults.pdf](http://www.cdc.gov/nccdphp/dnpa/physical/pdf/PA_Fact_Sheet_Adults.pdf) Retrieved 14 March, 2013, 6:45 pm.
- Deci, E.L., and Ryan, R.M. (2004). Exercise Self-Regulation Questionnaires. Self-Determination Theory: An Approach to Human Motivation and Personality—The Self-Regulation Questionnaires. <http://selfdeterminationtheory.org/questionnaires/10-questionnaires/48>; Accessed 14 December, 2012; 4:40 pm.
- Dunbar-Jacobe, J., and Mortimer-Stephens, M.K. (2001). Treatment adherence in chronic disease. *Journal of Clinical Epidemiology*, 54, S57–S60.
- Egede, L.E. and Osborn, C.Y. (2010). Role of motivation in the relationship between depression, self-care, and glycemic control in adults with type 2 diabetes. *The Diabetes Educator*, 36, 276–283.
- Fitness Management (2012) Module B: specific learning outcomes. [www.edu.gov.mb.ca/k12/cur/physhlth/frame\\_found.../4\\_fm.pdf](http://www.edu.gov.mb.ca/k12/cur/physhlth/frame_found.../4_fm.pdf); Accessed 6 March, 2012; 7:30 pm
- Fortier, M.S., Sweet, S.N., Tulloch, H., Blanchard, C.M, Sigal, R.J., Kenny, G.P. et al (2012). Self-determination and exercise stages of change: results from the Diabetes Aerobic and Resistance Exercise Trial. *Journal of Health Psychology*, 17, 87–99.
- Huebschmann, A.G., Crane, L.A., Belansky, E.S., Scarbro, S., Marshall, J.A., and Regensteiner, J. G. (2011). Fear of injury with physical activity is greater in adults with diabetes than in adults without diabetes. *Diabetes Care*, 34, 1717–1722.
- International Physical Activity Questionnaire (2012) [www.ipaq.ki.se/contact/html](http://www.ipaq.ki.se/contact/html); Retrieved at 6:34 pm on 21/2/2012.
- Jeon, C.Y., Lokken, R.P., Hu, F.B., and van Dam, R. M. (2007). Physical activity of moderate intensity and risk of type 2 diabetes: a systematic review. *Diabetes Care*, 30, 744–752.
- Korkiakangas, E.E., Alahuhta, M.A., and Laitinen, J.H. (2009). Barriers to regular exercise among adults at high risk or diagnosed with type 2 diabetes: a systematic review. *Health Promotion International*, 24, 416–427.
- Kurtze, N., Rangul, V., and Hustvedt, B. (2008). Reliability and validity of the international physical activity questionnaire in the Nord-Trøndelag health study (HUNT) population of men. *BMC Medical Research Methodology*, 8, 63 doi:10.1186/1471-2288-8-63.
- Lawton, J., Ahmad, N., Hanna, L., Douglas, M., and Hallowell, N. (2006). ‘I can’t do any serious exercise’: barriers to physical activity amongst people of Pakistani and Indian origin with Type 2 diabetes. *Health Education Research*, 21, 43–54.
- Lee, P.H., Macfarlane, D.J., Lam, T.H., and Stewart, S.M. (2011). Validity of the international physical activity questionnaire short form (IPAQ-SF): A systematic review. *International Journal of Behavioral Nutrition and Physical Activity*, 8, 115 doi:10.1186/1479-5868-8-115.
- Mori, D.L., Silberbogen, A.K., Collins, A.E., Ulloa, E.W., Brown, K.L. and Niles, B.L. (2011).

- Promoting physical activity in individuals with diabetes: telehealth approaches. *Diabetes Spectrum*, 24, 127-135.
- Morrato, E.H., Hill, J.O., Wyatt, H.R., Ghushchyan, V., and Sullivan, P.W. (2007). Physical activity in U.S. adults with diabetes and at risk for developing diabetes. *Diabetes Care*, 30, 203–209.
- O'Dougherty, M., Kurzer, M.S., and Schmitz, K.H. (2010). Shifting motivations: young women's reflections on physical activity over time and across contexts. *Health Education and Behaviour*, 37, 547-567.
- Osborn, C.Y., Amico, K.R., Fisher, W.A., Egede, L.E. and Fisher, J.D. (2010). An Information Motivation-Behavioral skills analysis of diet and exercise behavior in Puerto Ricans with diabetes. *Journal of Health Psychology*, 15, 1201–1213.
- Plotnikoff, R.C., Brez, S., and Hotz, S.B. (2010). Exercise behavior in a community sample with diabetes: understanding the determinants of exercise behavioral change. *The Diabetes Educator*, 26, 450–459.
- Ryan, R.M., and Deci, E.L. (2000). Intrinsic and extrinsic motivations: classic definitions and new directions. *Contemporary Educational Psychology*, 25, 54–67.
- Shahar, J. (2008). Helping your patients become active. *Diabetes Spectrum*, 21, 59-62.
- Shigaki, C., Kruse, R.L., Mebr, D., Sheldon, K.M., Ge, B., Moore, C. et al. (2010). Motivation and diabetes self-management. *Chronic Illness*, 6, 202–214.
- Sigal, R.J., Kenny, G.P., Wasserman, D.H., Castaneda-Sceppa, C., and White, R.D. (2006). Physical Activity/Exercise and Type 2 Diabetes: A consensus statement from the American Diabetes Association. *Diabetes Care*, 29, 1433-1438.
- Trost, S.G., Pate, R.R., Sallis, J.F., Freedson, P.S., Taylor, W.C., Dowda, M. et al (2002). Age and gender differences in objectively measured physical activity in youth. *Medicine and Science in Sports and Exercise*, 34, 350–355.



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## CASE REPORT

### Management of severe pelvic injury following road traffic accident in a resource-limited setting

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**A 34 year old woman involved in road traffic accident with severe anterior and posterior pelvic fractures with associated soft tissue injury was referred from Wa Regional Hospital 18 hours after the accident to Tania Specialist Hospital in Tamale. Emergency resuscitative measures such as catheterization and management of pain with analgesics were initiated. Computed topography (CT scan) or Magnetic resonance imaging has been recommended as the appropriate tools for risk assessment in such cases however none of this was available at the time of the accident. The only assessment tool available was the C-arm machine which was used to X-ray the pelvis in the following plane; antero – posterior pelvic - inlet and pelvic – outlet. Early internal reduction and stabilization of pelvis was immediately carried out using the procedure of open reduction and internal fixation (ORIF). Approximately 2 weeks after the operation, radiographs showed signs of healing and the patient was discharged on partial body weight bearing. Upon second review 12 weeks post operatively, complete recovery was accomplished.**

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**Keywords:** Anatomy, pelvic injury, motor accident, resource-limited setting, Ghana

#### INTRODUCTION

Pelvic fractures are severe injuries associated with varied morbidities. Mortality rates range from 10% to 50% depending on the severity of pelvic fracture, bleeding and the presence of associated injuries to the brain, thorax and abdomen (T'ile, 1988; Dalal *et al.*, 1989; Gonzalez *et al.*, 2002).

Treatment options have increased from simple pelvic slings and postural reduction to more complex internal and external fixations (Pohlemann *et al.*, 1994). Early effective management of severe pelvic trauma with modern medical devices such as CT-scan and MRI and techniques contributes significantly to survival to these patients (Ghanayem *et al.*, 1995; Durkin *et al.*, 2006). Computed topography and magnetic resonance imaging have been shown to be a very sensitive means of detecting pelvic fracture and associated injuries that often accompany pelvic fracture

and have become indispensable in the care of these patients. However in places where such modern medical devices are unavailable or inadequate, effective treatment may be compromised. This report presents the management of severe anterior and posterior pelvic fractures with associated soft tissue injury following road traffic accident with the aid of C arm machine in a resource limited setting.

#### CASE REPORT

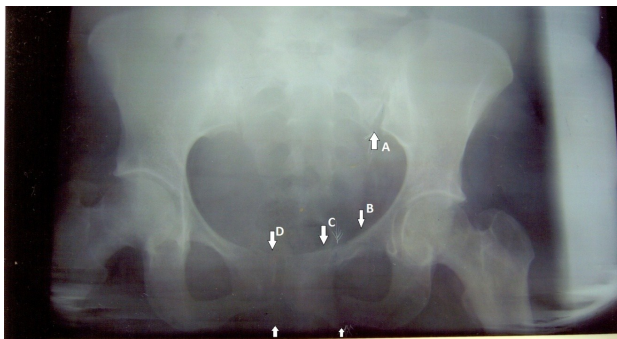
A 34 year old woman reported to the Tania Specialist Hospital situated in Tamale, the Northern Regional capital of Ghana upon referral from the Wa Regional Hospital in the Upper West region 18 hours after a road traffic accident with severe waist pain, inability to sit, stand or urinate. No history of loss of consciousness, amnesia and headache was reported but the patient complained of severe waist pain. There was no clinical evidence of abdominal, chest or head injuries. The patient had a soft and tender lower abdominal mass, about the size of a 16 weeks pregnancy and was moderately pale. Pelvic compression tenderness was positive both laterally and antero-posteriorly. Upon examination of the

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lower limbs, power in the left leg was grade 1 with a proximal one-third loss of sensation and that in the right leg was grade 4 with no sensory loss. Ankle and foot pulses were intact.

Radiological examination using Ultrasound revealed a full urinary bladder which was emptied by catheterization. No other abdomino-pelvic organ abnormality was detected. The pelvis was x-rayed in the antero-posterior plane as well as pelvic - inlet and pelvic - outlet planes. Diagnosis of the AO Type-C pelvic fracture with neurological deficit in the left leg (Butterfly-like anterior pelvis and left Malgaigne fracture), compressed bladder and left monoplegia were made (Figure 1).



**Figure 1: Pre-operative pelvic X-ray (A-P view); (A-dislocation of the sacroiliac joint; B, C, D, E shows butterfly-like fracture of the pelvis.**

Prior to surgery, the patient's blood haemoglobin level was  $8.0 \text{ g dL}^{-1}$  and as such was pre-operatively haemo-transfused with compatible whole blood. An open reduction and internal fixation (ORIF) operation on the anterior pelvis and intra-operative manual reduction of the dislocation in the left sacro-iliac joint was conducted on the patient (Figure 2).

Post-operative recovery was excellent, urethral catheter was removed after 72 hours and on the 4<sup>th</sup> post-operative day, sensation and power in the legs were almost completely restored and patient started to walk with the aid of shoulder crutches. All stitches were removed on the 8<sup>th</sup> post-operative day.

Two weeks following the operation the patient was discharged and was reviewed after six weeks (Figure



**Figure 2: Post-operative X-ray film of the pelvis after internal reduction and fixation**

3) and a second review 12 weeks post-operatively. By the twelfth week, the patient was able to walk without crutches and pelvic/vaginal examination showed adequate stability of the pelvic girdle.



**Figure 3: X-ray showing healed fractures (6 weeks after operation)**

## DISCUSSION

Fractures of the pelvic ring have been reported to comprise 2% to 8% of all skeletal injuries and are often associated with high-energy trauma, most commonly, motor vehicle accidents and falls from a height (Pennal *et al.*, 1979; Burgess *et al.*, 1990). Studies have shown that vehicular accident such as vehicles crashing into pedestrians, passengers being thrown out of moving vehicles, causes about 60% of pelvic fractures (Inaba *et al.*, 2004; McCormack *et*

*al.*, 2010). Among multiply injured patients with blunt trauma, about 20% have pelvic injuries (McCormack *et al.*, 2010). The incidence of pelvic fracture appears to be increasing secondary to increases in the number of high-speed motor vehicle accidents and the number of patients surviving these accidents due to airbags and safer car designs (Poole and Ward, 1994). In Northern Ghana the incidence of complex fractures including pelvic injuries are on the rise due to the poor state of the roads, indiscipline road users poor vehicle maintenance culture and over-aged vehicles (Afukaar *et al.*, 2003).

In the management of pelvic fracture, Pohlemann *et al* (1994) advocates stabilization of the sacro-iliac joint with ORIF (plates and/or screws). However this patient recuperated very well without the posterior pelvic ORIF. The early mobilization of the patient from 4<sup>th</sup> post-operative day may have prevented further complications such as development of thromboembolism.

The fundamental challenge for clinicians evaluating and managing patients with pelvic fracture in resource limited settings in Africa is the determination of immediate threats to life and to control such threats (Inaba *et al.*, 2004). Approaches to treatment vary depending on whether the main threat arises from pelvic fracture hemorrhage, or associated injuries, or both. The long term functional outcomes depend on the quality of the rigid fixation of the fracture, as well as management of associated pelvic neural and visceral injuries. Use of modern imaging technologies like CT-scan, MRI and C-Arm X-ray is essential for the achievement of quality management (Poole and Ward, 1994; Durkin *et al.*, 2006). The absence of some of this equipment in Northern Ghana complicates appropriate management of severe pelvic injury cases. The lack of CT-scan/MRI in Northern Ghana explains why investigations of posterior pelvic structures were not done prior to surgery in this case. Effective management of pelvis fracture is very critical to future economic and social activity of the patient especially in women of reproductive age since improper management may hamper vaginal delivery in such women although a history of pelvic fracture does not exclude vaginal delivery.

## CONCLUSION

In resource limited settings such as Northern Ghana effective management of severe pelvic fracture with good functional outcome is possible even without the appropriate modern medical equipments such as CT scan and MRI which have been stated as indispensable in such cases.

## COMPETING INTERESTS

The authors declare that they have no competing interests.

## REFERENCES

- Afukaar F.K., Antwi P. and Ofosu-Amaah S. (2003) Pattern of road traffic injuries in Ghana: Implication for control. *Injury Control and Safety Promotion* 10, 69-76.
- Burgess A.R., Eastridge B.J. and Young J.W. (1990) Pelvic ring disruptions. Effective classification system and treatment protocols. *J. Trauma* 30.
- Dalal S.A., Burgess A.R. and Siegel J.H. (1989) Pelvic fractures in multiple trauma: classification by mechanism is key to pattern of organ injury. Resuscitative requirements outcome. *J. Trauma* 29, 981-1002.
- Durkin A., Sagi H., Durham R. and Flint L. (2006) Contemporary management of pelvic fractures. *Am J Surg* 192, 211-223.
- Ghanayem A.J., Stover M.D., G and oldstein J.A. (1995) Emergent treatment of pelvic fractures. Comparison of methods for stabilization. *Clin Orthop Relat Res* 318, 75-80.mmb
- Gonzalez R.P., Fried P.Q. and Bukhalo M. (2002) The utility of clinical examination in screening for pelvic fracture in blunt trauma. *J Am Coll Surg* 194, 121-125.
- Inaba K., Sharkey P.W. and Stephen D.J. (2004) The increasing incidence of severe pelvic injury in motor vehicle collisions. *Injury* 35, 759-765.
- McCormack R., Strauss E.J., Alwattar B.J. and Tejwani N.C. (2010) Diagnosis and management of pelvic fractures. *Bull NYU Hosp Jt Dis* 68, 281-291.
- Pennal G.F., Tile M., Waddal J.P. and Garside H.

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*Kunbiere et al.,*

- 
- (1979) Assessment and classification. . *Clin. Orthop* 151.
- Pohlemann T., Bosch U., Gansslen A. and Tscheme H. (1994) The Hannover experience in management of pelvic fractures. *Clin Orthop*, 69-80.
- Poole G.V. and Ward E.F. (1994) Causes of mortality in patients with pelvic fractures. *Orthopedics* 17, 691-696.
- Tile M. (1988) Pelvic ring fractures: should they be fixed? *J Bone Joint Surg Br.* 70, 1-12.



## ORIGINAL ARTICLE

# Positive malignant margins in clinically diagnosed and excised benign breast lumps: a five year retrospective study at the Korle-Bu teaching hospital, Ghana

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This study was aimed at utilizing retrospective descriptive data to evaluate the percentage of clinically benign breast lumps that turned out to be histologically malignant and the prevalence of positive tumour margins among the malignant cases. A total of 2,917 registered cases of excised breast lump at the Department of Pathology spanning January 2005 to December 2009 were reviewed to evaluate the presence of malignancy and positive margins. Three hundred and twenty-two (11.0%) of the excised breast lumps were found to contain malignant tumours, out of which 142(44.1%) had positive tumour margins. Size of primary tumour ( $p=0.001$ ) and histologic subtype ( $p=0.002$ ) showed significant positive and negative associations in relation to positive tumour margins respectively. No significant association was observed between the positive tumour margins and histologic grade ( $p=0.363$ ). The study showed that clinically benign breast lumps could be malignant and not completely excised, therefore increasing the risk of local recurrence. Thus, it is recommended that all women with breast lumps have the triad (diagnostic workup) of clinical and radiological assessment, followed with histological studies.

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**Keywords:** Breast cancer, Excision biopsy, recurrence, positive margins

### INTRODUCTION

Simple excision biopsy is a standard surgical treatment procedure performed for clinically benign breast lumps, such as fibroadenoma, fibrocystic change and duct ectasia. Unfortunately, some of these lumps tend to be malignant, and not completely excised thus giving rise to the phenomenon of positive margins. There is no consensus as to what constitutes a positive or negative margin (Arriagada *et al.*, 2002; Blichert-Toft *et al.*, 1992). While there is debate about 1 or 2 mm margins, most will accept a margin of 3 mm as being negative (Kurtz, 1992). Published rates of positive margins in lumpectomies vary widely, ranging from 4% to 31% (Elkhuizen *et al.*, 1998; Kurtz *et al.*, 1989; Voogd *et al.*, 2001; Vrieling *et al.*, 2003).

Positive margins are associated with certain clinico-pathologic factors; such as age at diagnosis, size of the primary tumour, histologic subtype and histologic grade (Barthelmes *et al.*, 2003; Blichert-Toft *et al.*, 1992; Malik *et al.*, 2000).

In Ghana, there is no published literature on the prevalence of positive tumour margins among surgically excised breast lumps. This retrospective study was conducted to evaluate the percentage of clinically benign breast lumps that are histologically malignant, and to determine the prevalence of positive tumour margins among these cancerous lumps and also offer recommendations for the managements of early breast cancers.

### MATERIALS AND METHODS

#### Study site and design

All data were collected from the Department of Pathology, University of Ghana Medical School. The department receives surgical specimens from

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Korle-Bu Teaching Hospital, Greater Accra Metropolitan, and neighboring towns and Districts outside Accra, as well as other regions of the country. The study reviewed all cases of excised breast lumps that were clinically benign from January 2005 to December 2009.

### Sampling technique, Sample size and Sample processing

A total of 2,917 (71.0%) out of 4,109 breast specimens diagnosed clinically as benign were reviewed between January 2005 and December 2009. For each registered case, patient age, clinical characteristics of the breast cancer, histologic findings and margin status were recorded. Investigations were done on paraffin-embedded breast tissue stained with haematoxylin and eosin (H&E).

### Classification of breast tumours

Histologic sub-typing of tumours was based on the architecture and cytologic features of the tumour and grading was done according to the modified Bloom-Richardson grading (Bloom, 1950). Breast lumps diagnosed as clinically benign such as; fibroadenoma, fibrocystic change, duct ectasia, benign phyllodes tumour and duct papilloma in females were included. Positive margin was also defined as: tumour cells within 2 mm of one or more resection margins; tumour cells within one or more inked margins or tumour extending to one or more resection margins as stated by the pathologist. Breast lumps diagnosed in females as clinically malignant but had simple excision or wide local excisions were excluded from the study.

### Statistical analysis

Data was collected by the first author and cross checked by the third author. Categorical data were presented as proportion whilst continuous data were presented as mean±SD. Association was assessed using Pearson's product moment correlation. All data entry and cleaning were done using Microsoft Excel 2010 (Microsoft corporation) and statistical analyses performed using GraphPad Prism v6.0 (GraphPad software, San Diego California USA, [www.graphpad.com](http://www.graphpad.com)). In all analyses,  $p < 0.05$  was considered as statistically significant.

## RESULTS

### Characteristics of clinically benign breast lumps that are histologically malignant

From January 2005 to December 2009, 4,109 breast specimens were received in the Department of Pathology, of which 2,917(71.0%) were excised clinically benign breast lumps. Three hundred and twenty-two (11.0%) of the clinically benign breast lumps contained, malignant tumours. The ages of women with the malignant breast lumps ranged from 14 to 86 years, with a mean age of  $49.1 \pm 14.0$  years. Majority 97(31.1%) of these women were within the 40-49 years age group (Table 1). The macroscopic size of the malignant tumours within the breast lumps at the time of histological diagnosis ranged from 0.4 to 15 cm in size, with a mean of  $3.8 \pm 2.3$  cm. About half 132(51.1%) of the malignant lesions were within 3-5 cm (Table 1). Of the 71(22.1%) women who had symptoms at presentation, many 27 (38.0%) of them reported within 6-12 months of noticing the lump. Information on the laterality of the breast lumps were recorded for 294(91.3%) cases of which 163(55.4%) were on the left breast.

**Table 1: Characteristics of clinically benign lumps that was found histologically to be malignant**

Variable	Proportion
<b>Age (yrs)</b>	
<40	73(23.4%)
40-49	97(31.1%)
50-59	74(23.7%)
>60	68(21.8%)
<b>Main symptoms</b>	
Breast lump	388(98.7%)
Nipple discharge	5(1.3%)
<b>Duration (months)</b>	
1-2	15(21.2%)
3-5	17(23.9%)
6-12	27(38.0%)
>12	12(16.9%)
<b>Tumour size (cm)</b>	
≤2	65(25.3%)
3-5	132(51.4%)
>5	60(23.3%)

### Histologic characteristics of excised breast lumps that are malignant

A total of 311(96.6%) breast tumours were epithelial cancers, with 11 mesenchymal cancers. Majority 300 (96.5%) of the epithelial cancers were invasive, with 11 non-invasive cancers (ductal carcinoma insitu; DCIS). More than two-thirds 257(85.7%) of the invasive cancers were invasive ductal carcinoma not otherwise specified (NOS). A total of 200(77.8%) of the NOS had combined Bloom-Richardson grading, of which many 89(44.5%) were grade 2 (Table 2). Fifty-seven of the NOS were not graded due to poor preservation and loss of cytologic features. We found that a total of 142(44.5%) of the clinically benign breast lumps that were histologically malignant had positive margins and thus, not completely excised) (Table 2).

**Table 2: Histologic characteristics of invasive epithelial breast cancers**

Variable	Proportion
<b>Histologic type (n = 300)</b>	
Invasive duct (NOS)	257(85.7%)
Lobular	11(3.7%)
Mucinous	6(2.0%)
Micropapillary	10(3.3%)
Medullary	4(1.3%)
Apocrine	2(0.7%)
Tubolo-lobular	2(0.7%)
Neuroendocrine	1(0.3%)
Others	7(2.3%)
<b>Histologic grade (n=200)</b>	
Grade I	58(29.0%)
Grade II	89(44.5%)
Grade III	53(26.5%)
Positive margins	142(44.5%)

### Associations between positive malignant tumour margins and other tumour variables

Using Pearson's correlation, there was a significant positive association between positive tumour margins and the size of the primary tumour ( $r=0.14$ ,  $p=0.002$ ) and a negative association with the histologic type of tumour ( $r=-0.13$ ,  $p=0.003$ ) (Table 3).

### DISCUSSION

During the five year period of review (2005-2009),

### Positive tumour margins in excised breast lumps Der et al.,

**Table 3: Association between positive tumour margins, tumour size, histologic type of tumour and tumour grade using Pearson correlation**

Variables	Histologic type	Tumour grade	Positive margins
Tumour Size (cm)	0.14(0.001)	0.01(0.095)	0.14(0.002)
Histologic type		0.05(0.314)	-0.13(0.001)
Tumour grade			0.05(0.363)

### KEY: r-value(p-value)

11.0% of all the clinically benign breast lumps submitted to our institution contained malignant tumours. About 45% of the tumours were not completely excised and thus had positive tumour margins. This rate is high compared to published rates of positive margins in lumpectomies which is said to vary from 4% to 31% (Elkhuizen *et al.*, 1998; Kurtz *et al.*, 1989; Voogd *et al.*, 2001; Vrieling *et al.*, 2003). The observed difference could be due in part to the difference in the definition of positive margins as well as the reason for the removal of the lump. Whereas in this study the lumps were removed for diagnostic purpose, in the available data, the lumps were removed for the treatment of histologically confirmed early breast cancer. Therefore, there was no initial diagnostic work-up (triad) (consisting of clinical, radiologic and pathological assessments) which could have enhance the suspicion of malignancy and thus a wide local excision with axillary lymph nodes dissection offered.

For the authors, the big question that readily comes to mind is; what is the fate of this  $\approx 45\%$  of women with positive margins? Studies have shown that positive margin is a major risk factor for local recurrence (Asgeirsson *et al.*, 2003; Borger *et al.*, 1994; Fourquet *et al.*, 1989; Jobsen *et al.*, 2003) and systemic disease (Clarke *et al.*, 1985). The likely options for these women are re-excision and mastectomy. Moreover, re-admissions for re-excision to obtain clear margins or for mastectomy will bring increase cost and emotional distress for patients, as well as the potential for more scaring and defor-

mation at the surgical site.

Women who with clinically benign breast lumps that were histologically malignant were young with mean age of 49.0 years (SD=14.0). The youngest age at diagnosis from this study with carcinosarcoma is 14 years old. This is in agreement with available reports among breast cancer patients in Ghana (Clegg-Lamprey *et al.*, 2009; Stark *et al.*, 2010).

From this study, about half of the malignant tumour size were between 3.0-5.0 cm. The size of the tumour was also directly associated with the positive tumour margins but inversely with the histologic type of tumour. Although this study was based on simple excised breast lumps, it is in agreement with some published literature on positive tumour margins in lumpectomies (Fourquet *et al.*, 1989; Voogd *et al.*, 2001; Vrieling *et al.*, 2003).

Majority (71.0%) of the NOS that had modified Bloom-Richardson grading were of high grade, similar to available data in Ghana (Edmund *et al.*, 2013). The lack of association between positive tumour margins and tumour grade from this study is contrary to studies that found tumour grade as a risk factor for positive (Barthelmes *et al.*, 2003; Malik *et al.*, 2000) but agrees with studies that found grade not to be risk factor for positive margins (Cao *et al.*, 2005; Dooley and Parker, 2005; Keskek *et al.*, 2004).

## CONCLUSION

This study showed that 11.0% of clinically benign breast were histologically malignant. Of this number, about 45.0% had positive margins (not completely excised), and hence the risk of local recurrence. Since primary breast tumours in Ghanaian women are large and show association with positive tumour margins, it is recommended that all women with breast lumps have the triad (diagnostic workup) of clinical and radiological assessment follow with histological studies. This will enable surgeons offer the best management to reduce positive margins and local recurrence and if in doubt, patient should be offered wide excision.

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## COMPETING INTERESTS

The authors declare that they have no competing interests.

## REFERENCES

- Arriagada, R, Le, MG, Contesso, G, Guinebretiere, JM, Rochard, F, Spielmann, M (2002) Predictive factors for local recurrence in 2006 patients with surgically resected small breast cancer. *Ann Oncol* 13(9): 1404-1413.
- Asgeirsson, KS, McCulley, SJ, Pinder, SE, Macmillan, RD (2003) Size of invasive breast cancer and risk of local recurrence after breast-conservation therapy. *Eur J Cancer* 39(17): 2462-2469.
- Barthelmes, L, Al Awa, A, Crawford, DJ (2003) Effect of cavity margin shavings to ensure completeness of excision on local recurrence rates following breast conserving surgery. *Eur J Surg Oncol* 29(8): 644-648.
- Blichert-Toft, M, Rose, C, Andersen, JA, Overgaard, M, Axelsson, CK, Andersen, KW, Mouridsen, HT (1992) Danish randomized trial comparing breast conservation therapy with mastectomy: six years of life-table analysis. Danish Breast Cancer Cooperative Group. *J Natl Cancer Inst Monogr*(11): 19-25.
- Bloom, HJ (1950) Further studies on prognosis of breast carcinoma. *Br J Cancer* 4(4): 347-367.
- Borger, J, Kemperman, H, Hart, A, Peterse, H, van Dongen, J, Bartelink, H (1994) Risk factors in breast-conservation therapy. *J Clin Oncol* 12(4): 653-660.
- Cao, D, Lin, C, Woo, SH, Vang, R, Tsangaris, TN, Argani, P (2005) Separate cavity margin sampling at the time of initial breast lumpectomy significantly reduces the need for reexcisions. *Am J Surg Pathol* 29(12): 1625-1632.
- Clarke, DH, Le, MG, Sarrazin, D, Lacombe, MJ, Fontaine, F, Travagli, JP, May-Levin, F, Contesso, G, Arriagada, R (1985) Analysis of local-regional relapses in patients with early breast cancers treated by excision and radio-

- therapy: experience of the Institut Gustave-Roussy. *Int J Radiat Oncol Biol Phys* 11(1): 137-145.
- Clegg-Lamprey, JN, Aduful, HK, Yarney, J, Adu-Aryee, NA, Vanderpuye, V, Kyereh, M, Nkansah, A, Edwin, A (2009) Profile of breast diseases at a self-referral clinic in Ghana. *West Afr J Med* 28 (2): 114-117.
- Dooley, WC, Parker, J (2005) Understanding the mechanisms creating false positive lumpectomy margins. *Am J Surg* 190(4): 606-608.
- Edmund, DM, Naaeder, SB, Tettey, Y, Gyasi, RK (2013) Breast cancer in Ghanaian women: what has changed? *Am J Clin Pathol* 140(1): 97-102.
- Elkhuizen, PH, van de Vijver, MJ, Hermans, J, Zonderland, HM, van de Velde, CJ, Leer, JW (1998) Local recurrence after breast-conserving therapy for invasive breast cancer: high incidence in young patients and association with poor survival. *Int J Radiat Oncol Biol Phys* 40(4): 859-867.
- Fourquet, A, Campana, F, Zafrani, B, Mosseri, V, Vielh, P, Durand, JC, Vilcoq, JR (1989) Prognostic factors of breast recurrence in the conservative management of early breast cancer: a 25-year follow-up. *Int J Radiat Oncol Biol Phys* 17(4): 719-725.
- Jobsen, JJ, van der Palen, J, Ong, F, Meerwaldt, JH (2003) The value of a positive margin for invasive carcinoma in breast-conservative treatment in relation to local recurrence is limited to young women only. *Int J Radiat Oncol Biol Phys* 57(3): 724-731.
- Keskek, M, Kothari, M, Ardehali, B, Betambeau, N, Nasiri, N, Gui, GP (2004) Factors predisposing to cavity margin positivity following conservation surgery for breast cancer. *Eur J Surg Oncol* 30(10): 1058-1064.
- Kurtz, JM (1992) Factors influencing the risk of local recurrence in the breast. *Eur J Cancer* 28(2-3): 660-666.
- Kurtz, JM, Jacquemier, J, Torhorst, J, Spitalier, JM, Amalric, R, Hunig, R, Walther, E, Harder, F, Almendral, A, Brandone, H, et al. (1989) Conservation therapy for breast cancers other than infiltrating ductal carcinoma. *Cancer* 63 (8): 1630-1635.
- Malik, HZ, Wilkinson, L, George, WD, Purushotham, AD (2000) Preoperative mammographic features predict clinicopathological risk factors for the development of local recurrence in breast cancer. *Breast* 9(6): 329-333.
- Stark, A, Kleer, CG, Martin, I, Awuah, B, Nsiah-Asare, A, Takyi, V, Braman, M, Quayson, SE, Zarbo, R, Wicha, M, Newman, L (2010) African ancestry and higher prevalence of triple-negative breast cancer: findings from an international study. *Cancer* 116(21): 4926-4932.
- Voogd, AC, Nielsen, M, Peterse, JL, Blichert-Toft, M, Bartelink, H, Overgaard, M, van Tienhoven, G, Andersen, KW, Sylvester, RJ, van Dongen, JA (2001) Differences in risk factors for local and distant recurrence after breast-conserving therapy or mastectomy for stage I and II breast cancer: pooled results of two large European randomized trials. *J Clin Oncol* 19(6): 1688-1697.
- Vrieling, C, Collette, L, Fourquet, A, Hoogenraad, WJ, Horiot, JC, Jager, JJ, Bing Oei, S, Peterse, HL, Pierart, M, Poortmans, PM, Struikmans, H, Van den Bogaert, W, Bartelink, H (2003) Can patient-, treatment- and pathology-related characteristics explain the high local recurrence rate following breast-conserving therapy in young patients? *Eur J Cancer* 39(7): 932-944.

