

# Sociodemographics and School Environment Correlates of Clustered Oral and General Health Related Behaviours in Tanzanian Adolescents

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**Abstract:** *Objectives:* To identify underlying clusters of general and oral health behaviours and ascertain possible factors influencing the existence of the behaviours.

*Materials and Methods:* A cross sectional study was conducted among 4,847 school adolescents aged 11 to 17 years. Data were collected using a structured questionnaire in Kiswahili inquiring about general and oral health related behaviours, socio-demographics and adolescents' school relationship. Principal component analysis was employed to identify clusters of health behaviour. Frequency distribution for proportions, cross tabulations with chi-square and a two stage binary logistic regression were done.

*Results:* Principal component analysis identified four clusters from twelve health behaviours; hygiene practices, dietary behaviours, cigarette smoking & alcohol consumption and sedentary related behaviours. Girls, OR 0.8 (95% CI 0.7, 0.9); secondary school attendees, OR 0.5 (95% CI 0.4, 0.7) and adolescents with good school relationship OR 0.7 (95% CI 0.6, 0.8) were less likely to smoke or use alcohol. Urban residents were less likely OR 0.8, (95% CI 0.7, 0.9) to report acceptable dietary behaviours. Adolescents whose fathers had secondary education or higher, were in secondary schools and had good school relationship were most likely to have acceptable hygiene behaviours, OR 1.4 (95% CI 1.2, 1.6), 1.6 (95% CI 1.1, 2.2) and 1.4 (95% CI 1.3, 1.7), respectively.

*Conclusion:* Oral and general health behaviours of Tanzanian adolescents factored into four clusters with hygiene behaviours being most practiced and physical exercise the least. The clustered behaviours were influenced by socio-demographics and school environment.

**Keywords:** Health behaviours, Clustering, Adolescents, School relationship, Sociodemographic factors.

## INTRODUCTION

Human behaviours play a significant role in shaping health and wellbeing of an individual and the community at large. Principally the behaviours are not disease causatives but rather modulate the possibility of disease occurrence. Hence behaviours can either promote or detriment health. In particular; individual's dietary, hygiene, sedentary, physical activity, health care seeking behaviors, adherence to prescribed medical treatments, smoking and alcohol use behaviours affect both general and oral health [1-4]. Research show that smoking, use of smokeless tobacco and alcohol consumption have a strong link with cancer, cardiovascular disease, liver disease,

pancreatitis and diabetes [1,5]. Infrequent tooth-brushing, frequent consumption of sugary food items and tobacco use are significant factors associated with dental caries and periodontal diseases [6] whereas annual dentist visit and daily tooth brushing have been observed among people with head and neck cancers [7].

Adolescence is an age at which puberty and brain development lead into establishment of new sets of behaviours and capacities that enable transition in health behaviours of the youths. The developed behaviours are likely to persist through adulthood [8]. New sets of behaviours which are detractive to health and are developed during adolescence include; snacking, smoking, alcohol consumption and sedentary behaviour [9].

Clustering of health related behaviours employing a data-driven technique such as principal component

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analysis aims at exploring ways in which health-risk behaviours come together in populations. The data-driven clustering technique provides appropriate number of clusters with the same purpose in accordance to population characteristics. Consequently, a similar behaviour may load to a different cluster from one population to the other. For instance vegetable consumption and tooth brushing loading together as health promoting behaviours or differently as dietary and hygiene behaviours respectively. The benefits of clustering general and oral health behaviours are; to facilitate employing of common approaches for health interventions and increasing attention of oral health in policies addressing chronic conditions [10].

Several clusters for general and oral health related behaviours have been identified among adolescents in different populations. In European adolescents Ottevaere *et al.* [11] defined five clusters: unhealthy cluster, sedentary cluster, active & low diet quality cluster, inactive & high diet quality cluster, and healthy cluster. Petersen *et al.* [12] in Chinese adolescents identified three clusters (factors). Factor 1 comprising playing computer games, alcohol habits, tobacco habits, watching television, physical activity and the consumption of sugary foods/drinks. Factor 2 oral hygiene practices, healthy dietary habits and general hygiene practices and factor 3 visit to the physician and visit to the dentist. Two broad clusters were defined by Alzahrani *et al.* [13] among Saudi male adolescents. The first cluster included low fruit consumption, less frequent tooth brushing and low physical activity. The second cluster included high sweets consumption, smoking and physical fighting. Likewise, Åström and Mbawalla [14] identified two factors from seven health behaviours among Tanzanian secondary school adolescents namely; hygiene and snacking behaviours.

General and oral health behaviours among adolescents have been widely studied and presented in diverse ways. Sedentary and physical activities including time spent to watch television, play computer games and doing physical exercises are rare among African adolescents [15] compared to those in Western countries [16,17]. In African adolescents, Idowu *et al.* [18] reported 85.9% of physical inactivity among Nigerian adolescents and recently Ndagire *et al.* [19] reported 14% of young Ugandan adolescents participating in physical activities and 20% having sedentary life.

Smoking and alcohol consumption are among the new sets of behaviours that adolescents will develop.

African adolescents are not immune to smoking nor alcohol use [20] with prevalence ranging from 16.6% [21] to 23.5% [22] for smoking and 16.7% [23] to 32.8% [22] for alcohol use. Likewise studies done in Western countries reveal that 28% & 43% of Finnish [24], 34.3% & 51.5% of US [25] and 23.4% & 15.9% of Canadian [26] adolescents smoke or take alcohol respectively.

Dietary behaviours during adolescence may have immediate or long term effect on the health of the adolescent. Immediate effects may include dental caries due to frequent sugar consumption or anaemia as a result of low dietary iron intake, while long term use of high fat diets may lead to cardiovascular diseases. Inadequate daily fruits and vegetable intake have been reported in several African studies [14,19,27-29]. Frequent consumption of sugar containing foods and drinks have for a long period been reported to be as low as 9% in African countries [30] but recently, higher proportions (54%) have been reported [28,31].

Hygiene behaviours of the adolescents are reported to be at sub-optimal levels [12,14,32-34] despite the widespread knowledge on its importance and improved infrastructure to support the conduct of the behaviours. Proportions of adolescents with regular tooth brushing varied from 27.6% to 77.3% [12,33,34], washing hands regularly before meals from 54.8% to 65.2% [14,33,34], washing hands regularly after toileting from 58.4% to 73.5% [33,34] and washing hands with soap from 35.0% to 43.8% [14,33,34].

Adolescents' oral and general health behaviours are shown to be associated with sex, age, socioeconomic status (SES), parents' educational attainment and school performance [11,14,17,19,27,28,32,34-39]. Studies show that frequent use of sugary snacks and drinks are common among girls, young adolescents, urban residents and those whose parents have high education [14,28]. Regarding fruits and vegetables, their adequate intake is higher among primary school adolescents, those whose mothers have high education and with good school performance [19,27]. Regular tooth brushing is infrequent in boys, younger adolescents, rural residents and adolescents whose mothers have low education [17,34,35]. Optimal hygiene behaviours are more frequently reported among girls, younger adolescents, those with good school affiliation and whose parents have defined occupations [32,34]. Older adolescents and those with low educated parents [11] often report spending more

time on sedentary activities. According to Brodersen *et al.* [36], Stralen *et al.* [37] and Cerin *et al.* [38] boys spend more time in moderate to vigorous activities compared to girls. Moreover, smoking and alcohol use in African countries is less frequently reported in girls and good school performers [39].

Information on contextual behaviours of Tanzanian adolescents is scarce despite its significance in identifying key entry point as well as intersectoral collaboration for addressing adolescents' risk health behaviours. Therefore this study was conducted to identify underlying clusters of general and oral health behaviours and determine the factors influencing the existence of the behaviours.

## MATERIALS AND METHODS

A cross sectional study design was employed to survey general and oral health behaviours of school adolescents in their senior primary education years and junior secondary education years. The study was conducted in all the six geographical zones of Tanzania mainland capturing the rural, urban and peri-urban areas. The participants were in-school adolescents aged 11 to 17 years from both government and private schools amounting to 4,847.

Administratively, Tanzania is divided into regions and at the time of study, Tanzania mainland had twenty one regions. A multistage cluster sampling design was used for sampling the participants with regions being the first sampling unit where twelve regions were selected. The selected regions were stratified into urban and rural, to attain the four specific participants' age clusters (11, 13, 15 and 17 years) at regional level the schools were further stratified into primary and secondary schools. At school level 50 students were selected from each age cluster to take part in the study making the final sample of about 400 students from each region.

The WHO Global Oral Health Programme questionnaire was adopted for data collection. For easy application the questionnaire was translated into Kiswahili. The questionnaire inquired on general and oral health related behaviours namely; dietary habits, hygiene practices, alcohol consumption, cigarette smoking, time spent in a day to watch television & use computer, hours involved in physical exercise weekly. The independent variables inquired included; socio-demographics (age, sex, area of residence and parents level of education), school stage and school

relationship (liking school, feeling safe at school, days skipped classes, feeling bored with the school, feeling too much home work and parents' school expectations).

Data entry, processing and analysis was done using SPSS computer program version 20. Various ways were used to assess the study variables. Dietary habits were scored for each item (consumption of sugared milk, soft drinks, sweets, chewing gum, biscuits/ cakes, vegetables, fresh fruits and fresh juice) as 1= never, 2= seldom, 3= once or several times in a week, 4= once or more often a day. Consumption of vegetables, fresh fruits and fresh juice once or more often a day was recoded 1= good dietary behaviour while the rest were coded 0=having poor dietary behaviour. Consumption of sugared milk, soft drinks, sweets, chewing gum, biscuits/ cakes once or more often a day were recoded 0=having poor dietary behaviour, the rest were coded as 1= good dietary behaviour. The aggregate score of all dietary behaviours were dichotomized into 1= acceptable dietary behaviours (scoring 2-3) and 0= unacceptable dietary behaviours (scoring 0-1).

Hygiene practices were scored as; tooth brushing 1= seldom, 2= once a day, 3= twice a day 4= three times a day whereas washing hand before eating, after using toilet and using soap for hand washing as; 1=never, 2=rarely, 3= sometimes, 4= most of the time and 5= always. Tooth brushing seldomly or once per day was recoded 0=irregular while brushing twice or more per day was recoded 1=regular. Scores for washing hand before eating, after using toilet and using soap for hand washing were recoded into 0=poor (never, rarely, sometimes and most of the time) and 1=good (always). The summed scores for the hygiene behaviours were dichotomized into 0 = unacceptable hygiene behaviours and 1 = acceptable hygiene behaviours.

Smoking and alcohol consumption were assessed by inquiring on age at which the adolescent started to smoke or use alcohol. They were scored as 1=10 years, 2=11-13 years, 3= 14-15 years, 4= above 15 years, 5= not smoked/used alcohol. The responses were dichotomized into 0= not smoking/using alcohol (score 5) and 1= smoking/using alcohol (score 1-4). Additive values for the two behaviours were dichotomized into 0= not smoking nor using alcohol (scoring 0) and 1= smoking and alcohol use (scoring 1-2).

Time involved in physical exercise was scored as weekly hours an individual exercised and got out of

breath or sweat (0, 0.5, 1, 2-3, 4-6, 7). These hours were recoded into 0=Exercising (at least four hours in a week) and 1=Not exercising (less than four hours in a week). The number of hours spent on computer games per week were scored as 0, <1, 1-3, 4-6, 7-9, 10 or more. They were recoded into 1= spending at least one hour on computer games in a week and 0= spending less than one hour in a week. Time spent in a day to watch television was scored in hours as 0, <0.5, 0.5-1, 2-3, 4-5 or more than 5. The hours spent watching television were recoded into 0= spending less than two hours and 1= spending two or more hours. Sedentary behaviours were computed and the obtained sum dichotomized into 0= not having sedentary life style and 1= having sedentary life style.

Principal component analysis with varimax rotation was employed to identify clusters of the general and oral health behaviour where the sample suitability for factor analysis was assessed using KMO measure and Bartlett test of sphericity. Frequency distributions of the behaviours were determined and presented in proportions and cross tabulations and chi-square statistics were used to assess association of the clustered behaviours with sociodemographic factors and adolescents' school relationship. To assess for the direction and strength of the association as well as identifying possible confounders, a two stage binary logistic regression of the behaviours against independent variables was applied; sociodemographics

and adolescents' school relationship was conducted and presented in odds ratio and 95% confidence interval. The  $p$ -value < 0.05 was set as the level of significance.

The Tanzania's National Institute for Medical research granted ethical clearance. Permission to conduct the study was obtained from relevant authorities. Written informed consent was obtained from parents and the participants asserted to take part in the study.

## RESULTS

This study was conducted among 4,847 primary and secondary school students aged 11 to 17 years from 12 regions of mainland Tanzania. Their sociodemographic characteristics were presented earlier [29].

The sample was considered suitable for factor analysis as both the KMO measure (0.623) and Bartlett test of sphericity ( $p < 0.001$ ) exceeded the pre-set levels. Twelve general and oral health related behaviours of the adolescents were studied. Factor analysis through Principle component analysis of the 12 behaviours gave four main clusters as presented in Table 1. Cluster 1 had highest loadings for hygiene practices with  $r$  ranging from 0.791 to 0.357 and dietary behaviours on the second cluster with  $r$  ranging from

**Table 1: Factor Structure of General and Oral Health Related Behaviours Cluster in Interfactor Correlation Coefficient ( $r$ )**

General and oral health related behaviours	Cluster 1: hygiene behaviours $r$	Cluster 2: dietary behaviours $r$	Cluster 3: smoking and alcohol use $r$	Cluster 4: sedentary related behaviours $r$
Handwashing after using of toilet most of the time	0.791			
Handwashing using soap most of the time	0.746			
Handwashing before eating most of the time	0.710			
Toothbrushing at least twice a day	0.357			
Eat vegetables daily		0.785		
Consume sugary drinks and or snacks daily		0.734		
Eat fruits daily		0.700		
Cigarette smoking			0.832	
Alcohol consumption			0.821	
Time spent a week playing computer games				0.761
Time spent a day watching TV				0.662
Time spent a week in physical exercises				0.569

**Table 2: Frequency Distribution of General and Oral Health Related Behaviours among Participants**

Health related behaviours	%	n
<b>Hygiene Behaviours</b>		
Toothbrushing at least twice a day	65.5	3142
Handwashing before eating most of the time	74.4	3583
Handwashing after using of toilet most of the time	68.8	3315
Handwashing using soap most of the time	47.8	2305
<b>Dietary behaviours</b>		
Consume sugary drinks and or snacks daily	67.9	2738
Eat vegetables daily	44.9	2225
Eat fruits daily	26.0	1134
<b>Alcohol consumption and Smoking</b>		
Cigarette smoking	9.2	452
Alcohol consumption	18.2	880
<b>Sedentary behaviours</b>		
Spend at least 2 hours watching TV per day	24.5	1172
Spend at least 1 Hours a week playing computer games	13.5	648
Spend at least 4 hours a week in physical exercises	8.5	404

0.785 to 0.700. The third cluster had highest loading for cigarette smoking ( $r = 0.832$ ) and alcohol consumption ( $r = 0.821$ ) and the fourth cluster loaded highest for sedentary related behaviours with  $r$  ranging from 0.761 to 0.569.

Table 2 presents the distribution of participants' general and oral health related behaviours. Of the hygiene behaviours; hand washing before eating was the most frequently reported behaviour (74.4%) and hand washing using soap the least (47.8%). Daily consumption of sugary drinks and or snacks was the frequent dietary behaviour reported (67.9%) and daily fresh fruit consumption the least (26%). Nearly 10% of the adolescents reported to smoke and twice as much reported to consume alcohol. Sedentary related behaviours were the least reported of all the studied behaviours; spending at least 4 hours a week in physical exercise being reported by 8.5%.

Having sedentary lifestyle was statistically significant associated with participants' sex, area of residence and school relationship as well as parental education (Table 3). A larger proportion of boys (37.3%), urban and peri-urban residents (36.3%), those having poor school relationship (38.1%) had sedentary lifestyle than their counterparts. Similar participants whose fathers (39.3%) and mothers (42.1%) had secondary education. It was less likely for a girl (OR

0.8 (0.7, 0.9) and those with good school relationship (OR 0.8 (0.7, 0.9) to have sedentary related behaviours. On the other hand, higher odds of having sedentary related behaviours were reported for those whose parents had secondary education (Table 4).

Participants' age, sex, school stage and school relationship were statistically significant associated with their cigarette smoking and alcohol consumption behaviours (Table 3). Larger proportions of younger adolescents (23.8%), males (22.7%), those attending primary school (24.3%) and with poor school relationship (23.8%) reported to smoke and consume alcohol as compared to their counterparts. In multivariate with sociodemographics being covariates, both age and sex were statistically significant associated with alcohol consumption and smoking. When school factors were added into the first model; sex, school stage and school relationship retained their statistical significance; girls, secondary school attendees and adolescents with good school relationship being less likely to smoke or use alcohol, OR 0.8 (95% CI 0.7, 0.9), 0.5 (95% CI 0.4, 0.7) and 0.7 (95% CI 0.6, 0.8) respectively (Table 5).

Statistically significant associations were seen between participants' acceptable dietary behaviours and age, school stage and their area of residence. More older participants (49.5%), secondary school

**Table 3: Distribution of General and Oral Health Related Behaviours by Sociodemographic and School Factors**

Characteristics	Categories	Having sedentary life style % (n)	Smoking and Alcohol use % (n)	Acceptable Dietary behaviours % (n)	Acceptable hygiene behaviours % (n)
Age	11 to 14 years	35.4 (834)	23.8 (571)***	42.1 (796)	55.5 (1311)
	15 to 17 years	35.0 (836)	18.1 (444)	49.5 (959)***	58.1 (1389)
Sex	Female	33.2 (802)***	19.2 (476)***	46.4 (900)	56.9 (1384)
	Male	37.3 (868)	22.7 (539)	45.2 (855)	56.7 (1316)
Area of residence	Rural	32.9 (502)	21.8 (342)	71.5 (902)	49.6 (589)
	Urban and peri-urban	36.3 (1168)*	20.5 (673)	66.3 (1837)***	44.2 (1166)**
Fathers' level of education	Up to primary education	29.9 (409)***	21.8 (305)	48.5 (541)	52.9 (728)
	Secondary education or higher	39.3 (947)	20.4 (501)	45.1 (875)	61.6 (1482)***
Mothers' level of education	Up to primary education	29.4 (568)	19.6 (387)	47.6 (737)	55.2 (1071)
	Secondary education or higher	42.1 (819)***	21.7 (429)	45.5 (721)	61.0 (1180)***
School stage	Primary school	35.2 (854)	24.3 (600)	42.2 (816)	55.1 (1342)
	Secondary school	35.1 (816)	17.5 (415)***	49.6 (939)***	58.6 (1358)*
Adolescents' school relationship	Poor school relationship	38.1 (801)	23.8 (513)	46.1 (767)	52.5 (1109)
	Good school relationship	32.9 (869)***	18.7 (502)***	45.7 (988)	60.2 (1591)***
Adolescents' time spend with friends	Rare with friends	34.9 (998)	20.8 (608)	45.8 (1062)	56.3 (1610)
	Most time with friends	35.6 (672)	21.2 (407)	46.0 (692)	57.5 (1090)

Key: P &lt; 0.05 (\*), P &lt; 0.01 (\*\*), P &lt; 0.001 (\*\*\*).

**Table 4: Odds Ratio (95% CI) for having Sedentary Life Style Adjusted by Socio-Demographic and School Environment**

Characteristics	Categories	OR (95% CI) of Adjusted by socio-demographics	OR (95% CI) Adjusted by school environment
Age	11 to 14 years	1	1
	15 to 17 years	1.0 (0.9, 1.2)	1.0 (0.9, 1.2)
Sex	Male	1	1
	Female	0.8 (0.7, 0.9)**	0.8 (0.7, 0.9)**
Area of residence	Rural	1	1
	Urban and peri-urban	0.9 (0.8, 1.1)	0.9 (0.8, 1.1)
Fathers' level of education	Up to primary education	1	1
	Secondary education or higher	1.2 (1.0, 1.4)*	1.2 (1.0, 1.4)*
Mothers' level of education	Up to primary education	1	1
	Secondary education or higher	1.6 (1.3, 1.9)***	1.6 (1.4, 1.9)***
Adolescents' school relationship	Poor school relationship	-	1
	Good school relationship	-	0.8 (0.7, 0.9)***

Key: P &lt; 0.05 (\*), P &lt; 0.01 (\*\*), P &lt; 0.001 (\*\*\*).

**Table 5: Odds Ratio (95% CI) for Smoking and Using Alcohol Adjusted by Socio-Demographic and School Environment**

Characteristics	Categories	OR (95% CI) of Adjusted by socio-demographics	OR (95% CI) Adjusted by school environment
Age	11 to 14 years	1	1
	15 to 17 years	0.7 (0.6, 0.8)***	1.2 (0.9, 1.7)
Sex	Male	1	1
	Female	0.8 (0.7, 0.9)***	0.8 (0.7, 0.9)***
School stage	Primary school	-	1
	Secondary school	-	0.5 (0.4, 0.7)***
Adolescents' school relationship	Poor school relationship	-	1
	Good school relationship	-	0.7 (0.6, 0.8)***

Key: P &lt; 0.05 (\*), P &lt; 0.01 (\*\*), P &lt; 0.001 (\*\*\*).

**Table 6: Odds Ratio (95 % CI) for having Acceptable Dietary Behaviours Adjusted by Socio-Demographic and School Environment**

Characteristics	Categories	OR (95% CI) of Adjusted by socio-demographics	OR (95%CI) Adjusted by school environment
Age	11 to 14 years	1	1
	15 to 17 years	1.4 (1.2, 1.6)***	1.3 (0.9, 1.8)
Sex	Male	1	1
	Female	1.1 (0.9, 1.2)	1.1 (0.9, 1.2)
Area of residence	Rural	1	1
	Urban and peri-urban	0.8 (0.7, 0.9)***	0.8 (0.7, 0.9)***
School stage	Primary school	-	1
	Secondary school	-	1.1 (0.8, 1.5)

Key: P &lt; 0.05 (\*), P &lt; 0.01 (\*\*), P &lt; 0.001 (\*\*\*).

**Table 7: Odds Ratio (95% CI) for having Acceptable Hygiene Behaviours Adjusted by Socio-Demographic and School Environment**

Characteristics	Categories	OR (95% CI) of Adjusted by socio-demographics	OR (95% CI) Adjusted by school environment
Age	11 to 14 years	1	1
	15 to 17 years	1.0 (0.9, 1.1)	0.7 (0.5, 0.9)
Sex	Male	1	1
	Female	1.0 (0.9, 1.1)	1.0 (0.9, 1.1)
Area of residence	Rural	1	1
	Urban and peri-urban	1.0 (0.9, 1.2)	1.1 (0.9, 1.3)
Fathers' level of education	Up to primary education	1	1
	Secondary education or higher	1.4 (1.2, 1.6)***	1.4 (1.2, 1.6)***
Mothers' level of education	Up to primary education	1	1
	Secondary education or higher	1.1 (0.9, 1.3)	1.1 (0.9, 1.3)
School stage	Primary school	-	1
	Secondary school	-	1.6 (1.1, 2.2)**
Adolescents' school relationship	Poor school relationship	-	1
	Good school relationship	-	1.4 (1.3, 1.7)***

Key: P &lt; 0.05 (\*), P &lt; 0.01 (\*\*), P &lt; 0.001 (\*\*\*).

attendees (49.6%) and rural residents (71.5%) reported acceptable dietary behaviours (Table 3). The statistical significance was only maintained for area of residence in two stage multivariate analyses when bivariate statistical significant sociodemographic variables were adjusted for school stage. With urban residents being less likely OR 0.8 (95% CI 0.7, 0.9) to report acceptable dietary behaviours (Table 6).

Furthermore; participants' school stage, school relationship and their area of residence as well as parental education were statistically significant associated with the acceptable hygiene behaviours (Table 3). Larger proportions of secondary school attendees (58.6%), rural residents (49.6%) and those with good school relationship (60.2%) as well as those whose fathers (61.6%) and mothers (61%) had secondary school education reported acceptable hygiene behaviours. Hygiene behaviours retained statistical significance association with father's education (socio-demographic factor), school stage and school relationship in multivariate analyses. In addition participants whose fathers had secondary education, were in secondary schools and had good school relationship being more likely to have acceptable hygiene behaviours, OR 1.4 (95% CI 1.2, 1.6), 1.6 (95% CI 1.1, 2.2) and 1.4 (95% CI 1.3, 1.7) respectively (Table 7).

## DISCUSSION

Health related behaviours among adolescents are likely to vary from one society to the other. Therefore it was found plausible to identify clusters of the 12 studied behaviours to easily understand their patterns and future planning of interventions. Four clusters were identified bringing together behaviours with similar purpose. In cluster one three of the four behaviours related to body hygiene were highly correlated to each other on the other hand toothbrushing had weaker correlation to them. Similar observations were reported by Åström and Mbawalla [14]. Though all four behaviours intend to achieve body hygiene, tooth brushing is distinct from the three; tooth brushing being a technical act for the mouth whereas the other three are all about hand hygiene. The behaviours in cluster two (dietary) and three (smoking and alcohol use) were all highly correlated. However, cluster three had stronger inter-factor correlation probably because both behaviours are detrimental to health which has been earlier reported that unfavourable behaviours tend to co-exist in an individual [40]. Our finding is comparable to that of Busch *et al.* [41]. Spending time a week

playing computer games, physical exercises and watching television per day were clustered in one group because primarily they are all leisure. Moreover playing computer games and watching television impose opposite benefits to having physical exercises as evidenced by Busch *et al.* [41] who reported inter-factor correlation ( $r$ ) of the same strength but of opposing direction for excessively watching television and computer/internet use versus healthy physical exercise.

A few adolescents spending time playing computer games unlike watching television is largely explained by the fact that computers are not owned by most families. On the other hand, unsatisfactory involvement in physical exercises may be attributed by lack of awareness on its importance as previously Tanzania's health promotion programmes concentrated on controlling infectious diseases and advocating sufficient nutrition. Our study presents lower values than those of Brindova *et al.* [16] among Czech and Slovakian adolescents and Kim *et al.* [17] among US adolescents. Both socio-demographics and school environment influence adolescents' sedentary life as reported by Brodersen *et al.* [36] and Cerin *et al.* [38]. Higher parental education achievement supports adolescents' sedentary life as educated parents are likely to possess computers and television sets as well as having less family time to monitor their children's activities thus facilitating playing computer games and watching television. Bibiloni *et al.* [42], Ottevaere *et al.* [11] and Stralen *et al.* [37] reported lack of parental education influence on sedentary lifestyles of the adolescents. Girls and adolescents who had good relationship to school were unlikely to have sedentary life. In the Tanzanian communities; after school, adolescent girls are subjected to household chores which does not encourage sedentary behaviours. Additionally girls are unlikely to go to public computer game cafes which are usual access for computers in mid and low income families. To the contrary, Cerin *et al.* [38] found no sex differences in adolescents' sedentary lifestyle. Adolescents who enjoy school life are possibly the good school performers who will spend their time doing home works and participating in other school activities thus not having sedentary lifestyle.

Smaller proportions of adolescents in this study had started alcohol use and smoking compared to adolescents from Spain (36.4% and 27.4%) and South Africa (25.4% and 44%), [39,43] but similar to earlier reported by Mbatia *et al.* [23] among Tanzanian young adults aged 15-24 years. Though the current

proportions are small, it raises a concern since the figure may indicate a risk; of increasing incidences of non-communicable diseases in that alcohol consumption and smoking are potential risk factors. Besides there are no well established school health promotion strategies targetting non-communicable diseases. As would be expected of girls and good school performers not to engage in risk social behaviour; they were unlikely to smoke or use alcohol. Adolescents with good school relationship are usually good performers and have positive life expectations, similiary girls who have an opportunity of going to school hence would infrequently involve themselves with unfavourable health behaviours. Our findings are comparable to those of Morojele *et al.* [39] among South African adolescents.

Daily consumption of sugary snacks and drinks was as well studied among these adolescents whereby more than two thirds reported the behaviour. Such a behaviour raises concern to the current and future health of the adolescents as it is likely that these youths sustain themselves on snacking which might be insufficient for their growth and development. Furthermore, the frequent consumption of sugary snacks has an immediate effect on their dental health. In addition, eating of vegetables and fresh fruits is sub optimal probably due to their frequent snacking habits which makes it unlikely to use vegetables as a snack because in the Tanzanian settings, vegetables are perceived as part of the main meals. Alike findings were reported in Tanzania by Mbawalla and Ally [44] and in Ghana by Doku *et al.* [27] while Abdel-Hady *et al.* [28] among Egyptian adolescents reported higher values. Unlike the findings by Doku *et al.* [27] acceptable dietary behaviours in the current studied group were not influenced by parental education, sex and school environment. The observed unacceptable dieatry behaviours among urban adolescents may be explained by the easy access to sweet snacks and fast foods in urban areas compared to readily availability of fresh fruits and vegetables in rural areas. Similar findings on the urban influence on unacceptable dieatry behaviours were reported by Abdel-Hady *et al.* [28] among Egyptian adolescents.

Tooth brushing at least twice a day in this group was within acceptale levels, though somewhat lower than that reported in a previous study from nine African countries [33]. Generally the hygiene behaviours of the studied adolescents were sub optimal, demonstrated by more than a quarter not always washing their hands before eating nor after toileting and a bit more than half not using soap to wash their hands. This observation

may be attributed by insufficient hygiene facilities at schools where these adolescents spend most of the time during the day when the hygiene behaviours are expected to be practiced. Comparable findings were reported for the same age groups in African and South Asian countries [32-34]. Participants' fathers having secondary education, being in secondary schools and having good school relationship favoured the acceptable hygiene behaviours. Fathers' education attainment reflects wealthy family status hence access to hygiene facilities at their homes facilitating hygiene practices. Likewise, at secondary school level adolescents are likely to have acceptable hygiene behaviour because they have started to have sense of recognition promoting cleanliness and appearance. Comparable findings were reported by Tran *et al.* [32] who stated that optimal hygiene behaviours are more frequently reported among adolescents whose parents have defined occupations.

## CONCLUSION

Oral and general health behaviours of Tanzanian adolescents factored into four clusters with hygiene behaviours being most practiced and physical exercise the least. The clustered behaviours were influenced by sociodemographic factors and school environment. Parental education attainment and adolescents' school relationship affected sedentary and hygiene behaviours, while smoking and alcohol use were influenced by the adolescents' sex and school relationship.

## RECOMMENDATION

It is recommended that health professionals should target adolescents in implementing intervention aiming at preventing non-communicable diseases because most risk health related behaviours are acquired during this age. Interprofessional collaboration is important to augument focused interventions in order to combart risk health behaviours that encompasses four clustered domains with similar purpose in particular hygiene, diet, leisure, as well as smoking and alcohol use.

For better understanding of the underlying and explanatories of the adolescents' health behaviours cohort studies are recommended.

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