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Point of care testing and health parameter assessment in community pharmacy setting

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ABSTRACT

Objectives: Health screening is essential for early detection and prompt management of diseases, particularly chronic conditions. The study assessed and classified participants' health parameters according to standard classifications. Associations between participants' socio-demographics and observed health parameters were also assessed.

Materials and Methods: A cross-sectional survey of 400 adults was performed in a community pharmacy in Nigeria, using a pretested questionnaire. Health parameters were measured and analyzed descriptively with SPSS version 24. Chi-square tests and Pearson's correlation analysis were also performed ($P < 0.05$).

Results: A 100% response rate was recorded in the study. Mean temporal temperature (TT) and respiratory rate (RR)/minute were 36.627°C ± 0.3143 and 18.20 ± 3.261, respectively. Almost half, (195; 48.8%) were 20–39-years-old. Almost all (399/400; 99.8%) had normal TT, normal RR (347/400; 86.8%), fasting blood glucose (FBG) (326/400; 81.5%), and about a third had pains (156/400; 39.0%). Age was significantly associated with RR ($P = 0.008$) and FBG ($P = 0.002$). Gender and educational levels were significantly associated with RR ($P = 0.003$) and FBG ($P = 0.001$), respectively. A weak negative correlation (r = −0.018; $P = 0713$) between participants' FBG and TT was observed. FBG was negatively correlated with pain level (r = −0.091; $P = 0.068$), while pain level was negatively correlated with TT (r = −0.010; $P = 0.832$). Relationship between TT and RR showed weak positive correlation (r = 0.023; $P = 0.637$).

Conclusions: Health parameters were mostly normal, but selectively associated with socio-demographics. The study shows the role of community pharmacists in routine point of care testings, and findings suggest a focus of healthcare on the correlation of age, gender and educational level with FBG and RR.

Keywords: Blood glucose, Respiratory rate, Health screening, Community pharmacy, Nigeria

INTRODUCTION

As basic screenings, point of care tests (POCT) have expanded over time encompassing broader scope and applications. They are excluded by the Clinical Laboratory Improvement Amendment, and allow for quick, non-invasive screening at various settings including home and clinical settings.[1] Following the absence of symptoms at early stages of most chronic diseases, their existence is mostly noticed at onset of complications.[2] Therefore, regular screening is essential for early diagnosis and care. Point of care screening for communicable

diseases have also gained wide popularity and usage.[1,3] As the most frequent symptoms of communicable diseases (such as COVID-19), elevation of body temperature and respiratory rate (RR) are vital signs for point of care screening for communicable diseases.[4] It is noteworthy that basic health parameters are determinants of health status of individuals, and require regular monitoring for early detection and management of health-related conditions, particularly chronic diseases.[5]

Community pharmacists are notably the most accessible health care professionals, and this has positioned them to perform, manage and interpret POCT.[6] The previous studies have shown that community pharmacies are commonly utilized for various point-of-care screenings.[7] This has facilitated early detections and management of several potentially life-threatening conditions, and has also increased cost-effectiveness in the management of chronic diseases.[8] Blood pressure and blood glucose monitoring are most prevalent point of care screenings in community pharmacies.[9] It is a major means of providing patient-centered care by community pharmacists in Nigeria, who are mostly the first point of call for patients, and sometimes the only health professional seen for minor ailments. Health parameters are essential indicators of health status of the body. They enable the detection of communicable and non-communicable diseases, and provide information on the progress of disease management among patients. Health parameters are therefore essential tools for disease surveillance and assessment of epidemiological changes in disease patterns.

Nigeria is faced with a double burden of communicable and non-communicable diseases, and majority remain undiagnosed until onset of complications.[2,10,11] More so, the risk and prevalence of diabetes appear to be on the rise following several lifestyle-related factors in the country.[12] A previous study noted high prevalence of communicable and non-communicable diseases in Nigeria,[10] showing the need for early screening, for prompt detection and management. However, POCT is not common among residents of rural and sub-urban regions[13] who may rely on access from the community pharmacies. Given that disease prevention and health protection are important aspects of community pharmacy practice[14] and are considered essential outcomes of community pharmacy-based screenings, it is essential to document evidence of these screenings. More so, global epidemiological changes of disease distribution warrants study of general populations, including younger persons, for early detection of chronic diseases. The study aimed to illustrate the outcomes of diabetes screening, temperature and pain level screening in a Nigerian community pharmacy, which could be extrapolated to other pharmacies in the country and beyond. The study also assessed: (a) The participants' health parameters according to standard classifications, and (b) associations between participants' socio-demographics with observed health parameters.

MATERIALS AND METHODS

Study design

A cross-sectional study of socio-demographic characteristics and relevant health parameters of study participants at Mic Elliot pharmacy Akute were assessed from March 2019 to September 2019.

Study setting

Mic Elliot pharmacy carters for the pharmaceutical needs of residents of its host community – Akute, and its environs. With the services of two clinical pharmacists and other support staff, it collaborates with Laboratories and Hospitals for better health services. Akute is a sub-urban community situated in Ifo Local Government Area of Ogun State, Nigeria and is in proximity to the bustling city of Lagos. This makes it one of the commercially viable towns in the state, with residents being predominantly commercial traders, artisans, civil servants and industrial workers. Akute has I health center, 1 Missionary hospital, about 20 private hospitals and 14 registered pharmacies.

Sample size and technique

Raosoft sample size calculator was used to calculate the sample size.[15] Assuming a population of 20,000, confidence interval of 95%, margin of error of 5% and response distribution of 50%, the sample size was calculated as 377. A rounded number of 400 participants were enrolled in the study.

Inclusion and exclusion criteria

Persons who visited the pharmacy, assumed healthy, and of 20 years and above, were included in the study. Persons from whom informed consents were not obtained and persons with previously diagnosed chronic illnesses were excluded in the study.

Study instrument

A simple questionnaire consisting of two sections of socio-demographics and health parameter assessment was used for the study. The questionnaire was independently assessed by three clinical pharmacists, and pretested in twenty persons. Modifications were effected based on their responses and identified limitations.

Data collection

A simple questionnaire consisting of socio-demographic characteristics and health parameters sections was used in capturing participants' data. Assessment of health parameters was performed using approved methods and validated devices. Free Health Test flex banners were made and placed in strategic areas to create awareness for the study. Participants were individually informed about the study and asked to return between of 8.00 am and 9.00 am for fasting blood glucose (FBG) testing. The questionnaire was administered to participants who signed the informed consent form. The participants were allowed to rest for 5–10 min before the assessment tests. The tests were performed in a sequential order: FBG, RR, temporal body temperature, and level of pain. Data were collected by 2 pharmacists and 2 nurses trained in the use of basic devices for measuring vital signs.

Blood glucose testing

FBG test was chosen because of availability of test kits, ease of administration, accuracy, and repeatability. An American Diabetes Association (ADA) method was adopted and executed using Accu-Check® mg/mL Active Glucose Monitors Ref 07133766200/serial number GB14159424, Accu-Check® strips expiring September 2020 and Accu-Check® Softclix lancets expiring June 2023.[16,17] The test was performed within the early hours of the morning (not later than 9:00 am) and the procedure included:

1. Hands were washed and dried
2. Fingertip of a participant who had fasted for at least 8 h, were pierced with a lancing device to get a drop of blood
3. A test strip was then inserted into the glucometer
4. Once the test strip and flashing blood drop indicators were displayed on the glucometer, the test strip was removed from the meter
5. The blood drop was then applied to the center of the green field on the test strip
6. The test strip with the blood sample was inserted back into the glucometer
7. FGB level appeared within seconds on the meter's display window
8. The test results were recorded and the test strip removed from the meter and properly discarded.

Level of pain

This was determined using a simple pain thermometer by Herr *et al*.,[18] based on its simplicity, ease of administration and participants can easily identify the thermometer pain level that captures their level of pain. The pain thermometer concept was explained to each participant and each person was asked to point to the word on the thermometer that reflects his/her severity of pain.

Level 1 represents "No Pain," Level 2 represents "Mild Pain"

Level 3 represents "Moderate Pain," Level 4 represents "Severe Pain," Level 5 represents "Extreme Pain."

Level 6 represents "Pain as bad as it can be."

Participants' answers were then recorded and imputed into a computer for analysis.

Body temperature measurement

The temporal method of measuring temperature was selected based on ease of operation, instant measurement, hygiene, convenience, and relative accuracy. A validated and calibrated Rycom Non-Contact Infrared thermometer, Model JXB-182 with precision variation of 0.2–0.03% (manufactured by Guangzhou Jinxinbao Electric Co., Ltd China) was used for the study. It detects and measures the energy generated by the arterial blood flow, without interference from heat of the surrounding environment.[19] It has been demonstrated that this method of temporal artery (TA) temperature measurement method is more precise than the tympanic thermometry and better tolerated than rectal thermometry.[20]

Procedures for measurements included:

1. Client sat down for 5min to acclimatize
2. The forehead was dried and hair pushed back (if any)
3. Drafts were avoided (e.g., from air conditioning)
4. From a distance of 3–5 cm, client forehead (temporal region of the skull) was aimed with a Rycom Non-contact thermometer to obtain a temperature measurements
5. The thermometer measurement button was pressed and the body temperature instantly displayed
6. The result was then recorded for analysis.

Respiratory rate measurement

A Winner Loudstar stop watch W105 by MLabs India was used in calculating the number of respirations at rest per minute for each participant. One respiration is equal to the chest rising (inhale) and falling (exhale). The normal adult rate is 12–28 respirations/min.[21]

1. The participant was allowed to rest for 20 min
2. Hands were washed and dried
3. Fingers were placed on the participant's wrist to distract his/her while observing the chest movements
4. Participant's respirations were counted for 60 s (inhale + exhale =1 breath)
5. Any irregularities were noted
6. RR and any abnormal findings or irregularities were documented
7. Measured outcome was recorded for analysis.

Documentation approach of collected data

Each participant's data were captured in a numbered questionnaire and transferred same day to a formatted Microsoft excel sheet, in cells bearing same number on the questionnaire. After the screening, participants were counseled by the pharmacists. Health and medication education were also provided by the pharmacists based on participants' needs. Medication education was provided for over-the-counter medicines. Referrals were also made for persons observed to have abnormal values.

Outcome measures

The main outcome measures were FBG of study participants, RR, temporal temperature (TT) and level of pain, according to ADA classification.

Data analysis

All collated data were inputted into an Excel sheet and analysis was done using SPSS version 24. Descriptive and inferential statistics were performed. Chi-square test was used to measure association between participants' socio-demographics and RR as well as socio-demographics and fasting blood glucose. Pearson's correlation analysis was also performed to test the relationship between the health parameters. $P < 0.05$ was considered statistically significant.

Ethical Approval

An ethical approval (FMCA/470/HREC/01/2019/16) was obtained for the study from the ethical committee of Federal Medical Centre, Abeokuta. Written informed consent form was filled and signed by each participant before participation in the study.

RESULTS

A total of 400 adults participated in the study. Mean TT was 36.627°C ± 0.3143. Mean RR per minute was 18.20 ± 3.261.

Almost half of the study participants were between 20 and 39 years old (195; 48.8%), while 60–79 age group (40; 10.1%) were the least represented. The majority (301; 75.3%) were married and over half (212; 53.0%) were females. Among the participants (170; 42.5%) had tertiary, (161; 40.3%) secondary education level qualifications; and (284; 71.0%) were self-employed [Table 1].

Almost all (399; 99.8%) study participants had normal body temperature, (326/400; 81.5%) had normal blood glucose levels, (347/400; 86.8%) had normal RR, and (156/400; 39.0%) did not experience pains [Table 2].

Table 1: Socio-demographic characteristics of participants (n=400).

Socio-demographic characteristics	Frequency (n)	Percentage
Age (in years)		
20–39	195	48.6
40–59	165	41.3
60–79	40	10.1
Gender		
Male	188	47.0
Female	212	53.0
Marital status		
Single	97	24.2
Married	301	75.3
Divorced	2	0.5
Educational level		
Primary	31	7.7
Secondary	161	40.2
Tertiary	170	42.5
Others	38	9.6
Occupation		
Student	35	8.8
Civil Servant	50	12.5
Self-employed	284	71.0
Not employed	13	3.2
Retired	18	4.5

[Table 3] shows association between socio-demographics and RR, and socio-demographics and FBG. Age was significantly associated with RR ($P = 0.008$) and FBG ($P = 0.002$). Gender was significantly associated with RR ($P = 0.003$), while educational level was significantly associated with FBG level ($P = 0.001$).

Correlation analysis showed a weak negative correlation (r = −0.018; $P = 0.713$) between participants' FBG and TT. FBG and pain level also showed weak positive relationship (r = 0.091; $P = 0.068$). A weak negative relationship (r = −0.010; $P = 0.832$) was also observed between pain level and TT and this was not statistically significant. Relationship between TT and RR showed a weak positive correlation (r = 0.023; $P = 0.637$). A weak positive correlation (r −0.041; $P = 0.401$) was also found between age and RR.

DISCUSSION

The study observed that mean TT and mean FBG were within normal range. Normal RR was also common among participants. Meanwhile, socio-demographic characteristics were associated with FBG and RR. Weak positive correlation was observed for TT and RR. Weak negative correlation was also seen between RR and aging.

Findings from the study show that participants' health parameters were mostly within normal range. High prevalence of younger persons among study participants is likely responsible for this finding, as most chronic diseases tend to

Table 2: Classification and distribution of fasting blood glucose level, body temperature, respiratory rate, and pain level. *n*=400.

Parameters	Classification (ADA)	Frequency (*n*)	Percentage (%)
Fasting blood glucose (mg/mL)			
<70	Low	39	9.8
70–100	Normal level	326	81.5
101–125	Pre-diabetes	22	5.4
>125	Diabetes	13	3.3
Body temperature			
Below 35°C	Hypothermia	0	0.0
35–37.9°C	Normal	399	99.8
38–39.5°C	Fever	0	0.0
39.6-41°C	High fever	1	0.2
Above 41°C	Very high fever	0	0.0
Pain level			
1	No pain	156	39.0
2	Mild pain	109	27.2
3	Moderate pain	119	29.8
4	Severe pain	14	3.5
5	Extreme pain	2	0.5
Respiratory rate			
<12	Slow	0	0.0
12–20	Normal	347	86.8
>20	Rapid	53	13.2

ADA: American diabetes association

be more prevalent with increase in age.[22] A previous study in Nigeria found sex-related differences in health parameters of study participants.[23] These findings may connote socio-demographic-related impact on health parameters.

Socio-demographic characteristics were selectively associated with some health parameters. Age and sex were significantly associated with RR. Age and educational level were also associated with FBG. This corroborates with the findings from a previous study where age was significantly correlated to type 2 diabetes.[24] Socio-demographics are now widely recognized determinants of health associated variables.[24-27] This commonly results from social, biological, and functional changes that occur with age and other socio-demographics.

From our results, participants within the age of 20 and 39 did not have elevated FBG; however, the number of participants with elevated FBG increased with increasing age beginning from 40 years. This agrees with the work of Roy *et al.* which showed that age linearly affects RBG and BMI.[28] A Chinese study also reported an increase in plasma glucose level with increase in age in persons with no history of diabetes.[29] The reason for this could be age-related decrease in physiologic function,[30] particularly, age-related altered glucose metabolism.[31] This implies a potential significant association between age and increase in blood glucose. Increase in FBG levels is also significantly associated with increased risk of mortality.[32] Meanwhile, low awareness of diabetes and its symptoms and non-monitoring of FBG among non-diabetic persons as seen in a previous study in Nigeria,[33] portrays increased need for diabetes education.

Furthermore, a comparison of the FBG of the female and male participants shows that more males were pre-diabetic and diabetic, even though more women were tested. This corroborates the findings from a previous study in Nigeria where males were at higher risk of developing diabetes mellitus.[34] This study shows that sex might be a predisposing factor for high blood glucose. This sex-based difference in risks may be related to several biological differences in both sexes,[35] including higher adiponectin in females. Sex variation in blood glucose level could be due to the pattern in which fats are been stored in the different sexes, while men tend to store fats in body organs like liver, women store fat on the body surfaces such as the hips and buttocks. This agrees with the hypothesis that women need to have a higher fat deposit than men to become more predisposed to diabetes.[36] High FBG in males is associated with negative impact on the lipid profile, adipocytokines, and liver function.[37]

The study also shows weak positive correlation between age and RR. This corroborates with findings by Takayama *et al.*[38] Increase in RR might be a compensatory mechanism adapted by the body to maintain its physiological function. Increase in age is associated with changes in airflow dynamics, lung capacity, and decrease in mechanical characteristics of the respiratory system.[39] This is because as one ages, there is resultant change in the diaphragms, the chest wall and shape of

Table 3: Association between participants' socio-demographics and observed health parameters.

Socio-demographics	Respiratory rate			Fasting blood glucose			
	Slow	Normal	Rapid	Low	Normal	Pre-diabetes	Diabetes
Age							
20–39	-	192	3	2	172	10	-
40–59	-	126	22	17	126	7	10
60–79	-	30	7	3	28	5	3
		χ^2=15.707; df=5; *P*=0.008*			χ^2=35.592; df=15; *P*=0.002*		
Gender							
Male	-	160	28	16	150	14	8
Female	-	187	25	23	176	8	5
		χ^2=9.073; df=1; *P*=0.003*			χ^2=3.305; df=3; *P*=0.347		
Marital status							
Single	-	85	12	11	82	4	-
Married	-	260	41	28	242	18	13
Divorced	-	2	-	-	2	-	-
		χ^2=1.561; df=3; *P*=0.668			χ^2=6.078; df=9; *P*=0.732		
Occupation							
Student	-	33	2	5	28	2	-
Civil servant	-	43	7	4	41	3	2
Self-employed	-	245	39	26	236	13	9
Not employed	-	12	1	2	9	2	-
Retired	-	14	4	2	12	2	2
		χ^2=2.056; df=4; *P*=0.725			χ^2=11.282; df=12; *P*=0.505		
Education							
Primary	-	27	4	2	27	2	-
Secondary	-	142	19	18	125	12	6
Tertiary	-	147	23	15	143	8	4
Others	-	31	7	4	31	-	3
		χ^2=7.207; df=5; *P*=0.206			χ^2=38.354; df=15; *P*=0.001*		

*Statistically significant

the lung parenchyma[39] resulting to an increase in RR.[40] This dual decrease in physiological functions can be compensated for, by increase in RR.[38] This age-related respiratory changes are important considerations for health assessment in older adults.

Weak positive correlation was observed for TT and RR. This was consistent with findings from a previous study in Turkey.[41] Body temperature was reportedly an independent determinant of RR in a UK study.[42] Increase in body temperature and RR are usually suggestive of microbial infection. As a result of poor environmental conditions and inadequate potable water supply, there is high burden of communicable diseases in Nigeria[43] which usually present with increase in temperature; however, these parameters may be associated with other disease conditions.

The study has added to the body of evidence on selected health parameters of study participants in Nigeria, and the feasibility of point of care testing in community pharmacies. It has also shown that younger persons may be less associated with abnormal health parameters, irrespective of the global epidemiological changes in the risk of chronic diseases. However, the study was conducted in a single center, which limits its generalization.

CONCLUSION

Health parameters were mostly within normal range and were selectively associated with age, sex, and educational level. These demographic characteristics were mostly associated with blood glucose and RR. The results reinforce the feasibility and relevance of expanded point of care testing and screening in community pharmacies.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Hocking L, George J, Broberg EK, *et al*. Point of care testing for infectious diseases in Europe: A scoping review and survey study. *Front Public Health*. 2021;9:722943. doi: 10.3389/fpubh.2021.722943
2. Oguejiofor O, Odenigbo C, Onwukwu C. Diabetes in Nigeria: Impact, challenges, future directions. *Endocrinol Metab Syndr*. 2014;3:2. doi: 10.4172/2161-1017.1000130
3. Chen H, Liu K, Li Z, *et al*. Point of care testing for infectious disease. *Clin Chem Act*. 2019;493:138-147. doi: 10.1016/j.cca.2019.03.008
4. Alimohamadi Y, Sepandi M, Taghdir M, *et al*. Determine the most common clinical symptoms of COVID-19 patients: A systematic review and meta-analysis. *J Prev Med Hyg*. 2020;61:E304-E312. doi: 10.15167/2421-48/jpmh2020.61.3.1530
5. Lackland DT. Early-life detection of hypertension risks. *Hypertension*. 2017;70:486-487. doi: HYPERTENSIONAHA.117.09529
6. Kehrer JP, James DE. The role of pharmacists and pharmacy education in Point-of-care testing. *Am J Pharm Educ*. 2016;80:129. doi: 10.5688/ajpe808129
7. Albasri A, Bruel AV, Hayward G, *et al*. Impact of point-of-care tests in community pharmacies: A systematic review and meta-analysis. *BMJ Open*. 2019;10:e034298. doi: 10.1136/bmjopen-2019-034298
8. Wright D, Little R, Turner D, *et al*. Diabetes screening through community pharmacies in England: A cost-effectiveness study. *Pharmacy* (*Basel*). 2019;7:30. doi: 10.3390/pharamacy7010030
9. Adje DU, Oparah AC, Williams FE, *et al*. Assessment of point of care testing services in community pharmacies in Delta State Nigeria. *J Sci Pract Pharm*. 2016;3:115-20.
10. Ekpeyong CE, Edokang NE, Akpan EF, *et al*. Double burden, non-communicable diseases and risk factors evaluation in sub-Saharan Africa: The Nigerian experience. *Eur J Sustain Dev*. 2012;1:249-270. doi: 10.14207/ejsd.2012v1n2n249
11. Egware LO. Health Education in the Control and Prevention of Communicable and non-Communicable Diseases in Nigeria. Available from: https://www.nimr.gov.ng/nimr/wp-content/uploads/2015/11/3.egwari-communicable-and-non-communicable-diseases-in-nigeria.pdf [Last accessed on 2022 Jan 03].
12. Uloko AE, Musa BM, Ramalan MA, *et al*. Prevalence and risk factors for diabetes mellitus in Nigeria: A systematic review and meta-analysis. *Diabetes Ther*. 2018;9:1307-1316. doi: 10.1007/s13300-018-0441-1
13. Eyo OA, Ekpeyong NO, Omoronyia OE, *et al*. Unhealthy lifestyle and poor healthcare access. A cross sectional study in rural Cross River State, Niger Delta region, Nigeria. *J Med Sci Clin Res*. 2019;7:128. doi: 10.18535/jmscr/v7i2.128
14. Okoro RN, Nduaguba SO. Community pharmacists on the frontline in the chronic disease management: The need for primary healthcare policy reforms in low and middle income countries. *Explor Res Clin Soc Pharm*. 2021;2:100011. doi: 10.1016/resop-2021.100011
15. Raosoft. Sample Size Calaculator. United States: Raosoft Inc.; 2004. Available from: https://www.raosoft.com/samplesize.html [Last accessed on 2019 Jul 17].
16. Roche Diabetes Care. User Manual for Accu-Check Glucose Monitors. Mannheim, Germany: Roche Diabetes Care GmbH; 2017. p. 1-2.
17. ADA 1995-2019, Checking Your Blood Glucose. American Diabetic Association. Available from: https://www.diabetes.org/diabetes/medication-management/blood-glucose-testing-and-control/checking-your-blood-glucose [Last accessed 2021 Jul 17].
18. Herr K, Spratt KF, Garand L, *et al*. Evaluation of the Iowa pain thermometer and other selected pain intensity scales in younger and older adult cohorts using controlled clinical pain: A preliminary study. *Pain Med*. 2007;8:585-600. doi: 10.1111/j.1526-4637.2007.00316.x
19. Rycom. Instruction Manual for Rycom Non-contact Thermometer Model JXB-182. Nansha, Guangzhou: Guangzhou Jinxinbao Electronic Co Ltd.;2010;6-7.
20. Greenes D, Fleisher G. Accuracy of a noninvasive temporal artery thermometer for use in infants. *Arch Pediatr Adolesc Med*. 2001;155:376. doi: 10.1001/archpedi.155.3.376
21. Rodríguez-Molinero A, Narvaiza L, Ruiz J, *et al*. Normal respiratory rate and peripheral blood oxygen saturation in the elderly population. *J Am Geriatr Soc*. 2013;61:2238-2240. doi: 10.1111/jgs.12580
22. Singh S, Shankar R, Singh GP. Prevalence and associated risk factors of hypertension: A cross-sectional study in urban Varanasi. *Int J Hypertens*. 2017;2017:5491838. doi: 10.1155/2017/5491838
23. Ojoawo AO, Akinola OT, Abuila OB, *et al*. Selected body circumferences and cardiovascular parameters among a Nigerian community dwellers. *Int Med Rev Case Rep*. 2020;4:8-15.
24. Islam R. Association between socio-demographic factors and blood sugar levels in Type 2 diabetes mellitus patients in Bangladesh. *J Diabetes Mellitus*. 2017;7:151-159. doi: 10.4236/jdm.2017.73012
25. Iheanacho CO, Enechukwu OH, Aguiyi-Ikeanyi CN. Socio-demographic determinants of beliefs about COVID-19 vaccine in Nigeria. *J Res Pharm*. 2021;25:872-880. doi: 10.29228/jrp.83
26. Enchuan W, Dimopoulos AC, Tyrovolas S, *et al*. Sociodemographic indicators of health status using a machine learning approach and data from the English longitudinal study of aging (ELSA). *Med Sci Monit*. 2019;25:1994-2001. doi: 10.12659/MSM.913283
27. Prattay KM, Sarka R, Shafiullah AZ, *et al*. A retrospective study on the socio-demographic factors and clinical parameters of dengue disease and their effects on the clinical course and recovery of the patients in a tertiary care hospital of Bangladesh. *PLOS Negl Trop Dis*. 2022;16:e0010297. doi: 10.1371/journal.pntd.0010297
28. Roy P, Ghosh A, Roy D. Relationship between age, random blood sugar, BMI and WHCR and how it is affected by, gender and medicine. *Endocrinol Metab Int J*. 2018;2:124-128. doi: 10.15406/emij.2018.06.00165
29. Ko GT, Wai HP, Tang JS. Effects of age on plasma glucose levels in non-diabetic Hong Kong Chinese. *Croat Med J*. 2006;47:709-713.
30. Chia CW, Egan JM, Ferrucci L. Age-related changes in glucose metabolism, hyperglycemia, and cardiovascular risk. *Circ Res*. 2018;123:886-904. doi: 10.1161/circresaha.118.312806
31. Kalyani RR, Egan JM. Diabetes and altered glucose metabolism with ageing. *Endocrinol Metab Clin North Am*.

2013;42:333-347. doi: 10.1016j.ecl2013.02.010
32. Yi S, Park S, Lee Y, *et al*. Association between fasting glucose and all-cause mortality according to sex and age: A prospective cohort study. *Sci Rep.* 2017;7:8194. doi: 10.1038/s4159-017-08498-6
33. Eze UIH, Osoba DO, Iheanacho CO. Non-diabetic out-patients' lifestyle and awareness of Type 2 diabetes symptoms in two Nigerian Secondary Health Care Facilities. *Int J Hum Health Sci*. 2021;5:446-453. doi: 10.31344/ijhhs.v5i4.355
34. Iheanacho CO, Osoba DO, Eze UI. Evaluation of predominant risk factors for Type 2 diabetes mellitus among out-patients in two Nigerian secondary health facilities. *Afr Health Sci*. 2021;21:693-701. doi: 10.4314/ahs.v21i2.27
35. Kautzky-Willer A, Harreiter J, Pacini G. Sex and gender differences in risk, pathophysiology and complications of Type 2 diabetes mellitus. *Endocr Rev*. 2016;37:278-316. doi: 10.1210/er.2015-1137
36. Chester JG, Rudolph JL. Vital signs in older patients: Age-related changes. *J Am Med Dir Assoc*. 2011;12:337-343.
37. Ghadge AA, Diwan AG, Harsulkar AM, *et al*. Gender dependent effects of FBG levels and disease duration on biomarkers in Type 2 diabetes: A pilot study. *Diabetes Metab Syndr*. 2017;Suppl 1:S481-S489. doi: 10.1016/j.dsx.201.03.041
38. Takayama A, Nagamine T, Kotani K. Aging is independently associated with an increasing normal respiratory rate among an older adult population in a clinical setting: A cross-sectional study. *Geriatr Gerontol Int*. 2019;19:1179-1183. doi: 10.1111/ggi.13788
39. Kim J, Heise RL, Reynolds AM, *et al*. Ageing effects on airflow dynamics and lung function in human bronchioles. *PLoS One*. 2017;12:e0183654. doi: 10.1371/journal.pone.0183654
40. Sharma G, Goodwin J. Effect of age on respiratory system physiology and immunology. *Clin Interv Aging*. 2006;1:253-260. doi: 102147/ciia.2006.1.3.253
41. Ozdemir B, Yalcin SS. The role of body temperature on respiratory rate in children with acute respiratory infections. *Afr Health Sci*. 2021;21:640-646. doi: 10.4314/ahs.v21i2.20
42. Davies P, Maconochie I. The relationship between body temperature, heart rate and respiratory rate in children. *Emerg Med J*. 2009;26:641-643. doi: 10.1136/emj.2008.061598
43. Iheanacho CO, Eze UI. Antimicrobial resistance in Nigeria: Challenges and charting the way forward. *Eur J Hosp Pharm*. 2022;29:119. doi: 10.1136/ejhpharm-2021-002762

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