

Service Indicators (Coverage/Access, Quantity, and Cost) of Safe Domestic Water Supply in Selected Communities of Enugu State, Southeast Nigeria and 2015 Water Related MDG: A Survey Study

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ABSTRACT

Background: Domestic water supply is defined as water used for all domestic purposes. Globally, between 1990 and 2010, over 2 billion people gained access to improved sources of drinking water, whereas 783 million people did not. In Nigeria, in 2013, about 59.6% of the population gained access to safe drinking water, and in Enugu State, 47.5%.

Aim: The aim of this study was to determine the indicators of safe domestic water supply in five rural communities of Enugu State, which might help to explain why Nigeria could not achieve the MDG target of provision of safe drinking water for 75% of the population in 2015.

Materials and Methods: Structured questionnaire were administered to 297 households in the study area. Data were analysed as frequency distributions, t-test and Pearson product moment correlations using MaxStat (version 3.60) statistical software.

Results: Mean access to domestic water supplies was 15.38 minutes, mean cost = 1172 Naira, mean daily per capita water use = 22.06 liters. Between access and daily per capita water use, $r = -0.59$ ($p = 0.29$), between access and cost, $r = 0.77$ ($p = 0.13$), between cost and per capita daily water use, $r = -0.99$ ($p = 0.11$).

Conclusion: Poor service indicators of domestic water supplies in Enugu State might have contributed to Nigeria's inability to attain in 2015 the drinking water related MDG target. Nigeria needs to pursue with vigor the targets of her 'vision 2020', to adequately provide affordable safe domestic water for the people by 2020.

Key Words: Domestic, Supply, Access, Per capita, Service, Indicator

INTRODUCTION

Water constitutes between 60% and 70% of the body weight of an adult man, weighing 70kg on the average. [1,2] It is slightly less for women, because of the fat content (about 55% of the body weight). Domestic water supply is defined as water used for all domestic purposes (consumption, bathing and food preparation). [3,4] For the health of consumers to be preserved, domestic water supply has to be adequate and safe. And to guarantee these, the World Health

Organisation (WHO) came up with the so called service indicators of safe domestic water supplies many years ago. [5] These indicators include the quality (the proportion of samples or supplies that comply with guideline values for drinking-water and minimum criteria for treatment and service protection), coverage (the percentage of the population that has a recognizable water supply), quantity (the average volume of water used by consumers for domestic purposes, expressed as litres per capita per day), continuity (the

percentage of the time during which water is available) and cost (the tariff paid by domestic consumers). Three of the five indicators of safe domestic water supply examined by this study include access, quantity and cost.

The first service indicator, access to safe water (and sanitation), is a human right that applies in times of peace and emergencies. [6] In defining access, it is important to consider the context of the locality, quantity of water per person per day, distance and/or time to the water source and the percentage of the population that uses drinking water from improved sources. [7]

Statistics have shown that globally, between 1990 and 2010, over 2 billion people gained access to improved sources of drinking water whereas, 783 million did not. [8] Africa alone constitutes almost half of this 783 million without access to improved sources of domestic water supplies over the period in question. Specifically, in 2009, out of 1 billion people in Africa, 341 million (34.1%) lacked access to clean drinking water. [9] It has also been reported that lack of safe water and sanitation costs sub-Saharan Africa around 5% of its Gross Domestic Product (GDP) each year. Households in rural Africa spend an average of 26% of their time fetching water, with women and children mainly burdened with this task. [9] Available statistics suggest that water quality is declining globally and climate change is likely to increase the variability of water resources distribution across Africa.

In Nigeria, in 2013, about 59.6% of the population had access to safe drinking water. [10] This represents some 5.4% improvement from the coverage in 2008. The 2014 MDG Survey further reported an improvement in the national access, attaining a new level of 62.2%. However, these figures represent the mean access, as disparity exists between urban and rural areas, between states and between geopolitical zones of the country. This disparity which was aptly captured by the

Nigeria Core Welfare Indicators Questionnaire Survey (NCWIQS), revealed that the South West had the highest coverage rates (73.5% of the population was using water from improved sources), while the North East had the lowest coverage (less than one-third has access to improved water sources) and coverage for the South East and South-South in between these figures. [11]

In Enugu State, the situation appears to be worsening, in spite of the reported improvement at the national level. This is reflected in the statistics which show that access to safe drinking water has declined from 63.2% in 2008 to 47.5% in 2013. [10, 12]

Quantity of domestic water needed per person per day or daily per capita water use is another indicator of safe domestic water supply. Presently, there is no consensus on the amount of water required by an individual per day. As a matter of fact, the amount of water consumed by an individual per day may be influenced by the climate, physical and physiologic states, age, sex and distance to the water source. Consequently, water consumption increases in warm climate, with increased physical activity and during pregnancy and lactation. Existing estimates of per capita daily water use have a very wide margin of variation lying between 10 litres (for low income countries) and 350 litres (for high income countries). [13-16]

In Nigeria, per capita water use per day is not uniform for rural, semi-urban and urban areas. It varies between 30 litres and 120 litres, depending on the locality. [17] Using locality as the main criterion for determining daily per capita water use, the National Policy on Water and Sanitation of 2000 prescribed 30 litres, 60 litres and 120 litres per person per day for rural communities, semi-urban and urban areas respectively. This Policy aimed to tackle the problem of access to safe domestic water supply and sanitation. Its main thrust was provision of sufficient potable water and adequate sanitation to all Nigerians in an affordable and sustainable way through

participatory investment by all the tiers of government, the private sector and the beneficiary. However, in 2009, when it became evident that the set targets in the National Policy on Water and Sanitation of 2000 could not be met, new ones had to be set. This was when the so called Vision 2020, which contained some adjustments in the goals and targets of the National Policy on Water and Sanitation of 2000 came into being. ^[18] Vision 2020 aimed in the short term (2009-2011) to increase national improved water supply coverage from current 47% to 50%, in the medium term (2011-2015) to increase coverage from 50% to 75% and in the long term (2016-2020) to increase coverage from 75% to 100%. In Enugu State, the extent of implementation of this vision 2020 remains unknown as official statistics on access and per capita water use in the rural communities, semi-urban and urban areas are not available.

The third and last service indicator of provision of safe domestic water supply is cost or tariff. To realistically determine the cost of domestic water supplies in Nigeria is quite difficult as sources of domestic water supplies vary from one place to another. While some consumers use man-made sources (various sources of ground water such as boreholes and taps), others use natural sources (springs, streams, ponds, rivers and harvested rainwater) the cost of which cannot be directly determined. Still others use commercial sources (vended water such as sachet and bottled water and water from water tankers), while another category uses mixed sources (combination of all the available sources). This could be one reason statistics on costs of domestic water supplies are not available at the national level. Similarly, at the state level, like in Enugu, statistics on costs of domestic water supplies are also not available. However, an estimate of this could be extrapolated from the general consumption pattern for the state for any given year, bearing in mind that these estimates do not reflect the present realities whereby households spend far above these

extrapolated figures on the cost of provision of domestic water supplies as the natural, man-made and commercial based supplies have seasonal variations.

Review of literature has revealed that in Enugu State, the WHO service indicators of safe domestic water supply have not been documented anywhere in literature. The need to determine these indicators of safe domestic water supply in the State therefore forms the aim of this study. Determination of these service indicators will help to see to what extent they had contributed to the inability of the country to achieve the MDG target of provision of safe drinking water for 75% of the population in 2015.

MATERIALS AND METHODS

The study was a cross-sectional survey carried out in five selected rural communities of Enugu State. According to the National Population Commission (NPC). ^[19] Enugu state has a population of 3,267,837. The LGA of study-Ezeagu - has a population of 170, 603. ^[19] Using the Taro-Yamane formula, a sample size of 395 households was obtained from this population. However, only a total of 297 representatives of the various households who reside permanently in these communities, that were available, were included in the study. Indigenes of the communities who reside outside the communities but were present at the time of the study were excluded.

Multistage sampling techniques were used for the sampling. Through balloting, Enugu West Senatorial District (out of 3), Ezeagu LGA (out of 17) and the five communities of the LGA (out of 23), namely Umusuru, Afor-Ugwu, Iwollo, Obinofia-Ndiagu and Mkpagu, were randomly selected. The households to which copies of the structured the questionnaire were eventually administered, were selected through accidental sampling technique.

Administration of the questionnaire in every community was preceded by a visit to significant person(s) with whose help the

households were mobilized. In all the communities, the services of local information disseminators ('town criers') were engaged in mobilizing the people. Letters were also written to their traditional rulers, town union executives, opinion leaders and churches.

Administration of the questionnaire was by the researcher and his assistants. Mode of administration of the questionnaire was through oral interview in vernacular, as most of the rural dwellers were illiterate and semi-literate who could not communicate properly in English language. The few literate ones amongst them filled out the questionnaire themselves.

To avoid duplication, no two adult members of the same household were allowed to complete the questionnaire. The communities that were used for the pilot study (Adu-Achi, Obinagu, and Ihuezi, all in Enugu State) were also excluded from this study.

In some communities, the administration of the questionnaire was house-to-house as it was not possible to assemble the people at one place at the same time; in some other communities, it was organized in the market places; while in others the people were gathered in their local health facilities. All the communities were visited at times that were convenient for them to ensure maximum turnout.

Data were collected over a period of 20 weeks (from July to November 2014). The data so generated were analyzed as frequency distributions, t-test and Pearson product moment correlation analysis with p-value set at ≤ 0.05 level of significance, using MaxStat (version 3.60) statistical software. Distribution of respondents, cost of domestic water supplies and per capita daily water use were analysed as frequency distributions; differences between access distance and roundtrip time were analysed as t-test; while the relationships between access and per capita water use; access and cost of domestic water supply; and cost of domestic water supply and daily per capita

water use were analysed as Pearson product moment correlations.

RESULTS

297 copies of the questionnaire were administered to respondents from 297 households in the five communities of the study area. Of the 297 respondents 131 (44.2%) were males, while 166 (55.8%) were females (Table 1).

Table 1: Distribution of respondents by sex

Total	Male	Female
297	131 (44.2%)	166 (55.8%)

Table 2 shows that the distribution of respondents in the five communities was not uniform. The largest number of respondents was seen at Obinofia-ndiagu with 126 (42.4%), followed by Mkpagu with 66 (22.2%), Iwollo with 54 (18.2%) and Afor-ugwu with 27 (9.1%). Umusuru had the least number with 24 (8.1%).

Table 2: Distribution of respondents by communities

Community	Number of respondents
UMUSURU	24 (8.1%)
AFOR-UGWU	27 (9.1%)
IWOLLO	54 (18.2%)
OBINOFIA-NDIAGU	126 (42.4%)
MKPAGU	66 (22.2%)

Table 3 shows access to sources of domestic water supply. The result shows that all the communities in the study area had roundtrip time less than 30 minutes and access distance less than 1000 metres. With respect to roundtrip time, Afor-ugwu had the highest with 26 minutes, while Iwollo had 23 minutes, Mkpagu 17.2 minutes, Umusuru 10.5 minutes and Obinofia-ndiagu 0.2 minutes. The mean roundtrip time in the five communities was 15.4 minutes. Access distance was biggest at Afor-ugwu with 34 metres, while at Mkpagu it was 23.5 metres, at Iwollo 20 metres, at Umusuru 4 metres and at Obinofia-ndiagu 0.2 metres. Mean access distance in the five communities was 16.3 metres. Between access distance and time, there was no significant difference ($p=0.91$).

Table 4 shows the cost (in Naira) of domestic water supplies in the five

communities. In two communities, Obinofia-ndiagu and Mkpagu, monthly cost of domestic water supplies was zero Naira. The community with the highest monthly cost of domestic water supply was Afor-ugwu (2540 Naira), followed by Iwollo (2120 Naira) and Umusuru (1200 Naira). Mean monthly cost of domestic water supply for the five communities was 1172 Naira

Table 3: Access to Domestic Water Supplies in Enugu state

Community	Distance (in metres)	Time (in minutes)
UMUSURU	4	10.5
AFOR-UGWU	34	26
IWOLLO	20	23
OBINOFIA-NDIAGU	0.2	0.2
MKPAGU	23.5	17.2
Mean	16.3	15.4
t		0.123
p		0.91
WHO (2011) (basic)	1000	30

Table 4: Costs of Domestic Water Supplies per month (in Naira) in Enugu state

Community	Cost of domestic water supplies per month (in Naira)
UMUSURU	1200
AFOR-UGWU	2540
IWOLLO	2120
OBINOFIA-NDIAGU	0.00
MKPAGU	0.00
Mean	1172
NBS (2012)	637

The result shows that all the five communities had daily per capita water use less than 30 litres (Table 5). Obinofia-ndiagu had the highest per capita daily water consumption with 29 litres, while at Mkpagu it was 25.7 litres, at Iwollo 19.7 litres, at Afor-ugwu 19 litres and at Umusuru 16.9 litres. The mean per capita daily domestic water use in the five communities was 22.1litres.

Table 5: Per Capita Daily Water Use in Enugu state

Community	Per capita daily water use (in litres)
UMUSURU	16.9
AFOR-UGWU	19.0
IWOLLO	19.7
OBINOFIA-NDIAGU	29.0
MKPAGU	25.7
Mean	22.1
FMWR (2000) (rural areas)	30

Table 6 shows the relationship between access to sources of domestic water

supplies and daily per capita water use in the five communities. The correlation between access and daily per capita water use was moderate and negative ($r = -0.59$), but not significant ($p = 0.29$). The correlation shows that as the access time (roundtrip) increases, daily per capita water use decreases proportionately.

Table 6: Relationship between access and per capita water use

Community	Access (in minutes)	Daily per capita water use (in litres)
UMUSURU	10.5	16.9
AFOR-UGWU	26	19.0
IWOLLO	23	19.7
OBINOFIA-NDIAGU	0.2	29.0
MKPAGU	17.2	25.7
Mean	15.4	22.1
P-value		0.29
r		-0.59

The relationship between access to domestic water supplies and cost of domestic water supplies is shown in Table 7. From the result it is seen that the correlation between access and cost of domestic water supplies in the five communities was positive and strong ($r = 0.77$), but not significant ($p = 0.13$). The correlation shows that as access time increases, cost of domestic water supplies also increases proportionately.

Table 7: Relationship between access and cost of domestic water supply

Community	Access (in minutes)	Cost of domestic water supply (in Naira)
UMUSURU	10.5	1200
AFOR-UGWU	26	2540
IWOLLO	23	2120
OBINOFIA-NDIAGU	0.2	0
MKPAGU	17.2	0
Mean	15.4	1172
p-value		0.13
r		0.77

Table 8 shows the relationship between cost of domestic water supplies and daily per capita water use in the five communities. The correlation between cost of domestic water supplies and daily per capita water use was negative and very strong ($r = -0.99$), but not significant ($p = 0.11$). The correlation shows that there is a pronounced decrease in daily per capita water use as the cost of domestic water increases.

Table 8: Relationship between Cost of domestic water supply and daily per capita water use

Community	Cost of domestic water supplies per month (in N)	Per capita water use (in litres)
UMUSURU	1200	16.9
AFOR-UGWU	2540	19.0
IWOLLO	2120	19.7
OBINOFIA-NDIAGU	0.0	29.0
MKPAGU	0.0	25.7
Mean	1172	22.1
p-value		0.11
r		-0.99

DISCUSSION

Sources of domestic water supply can be broadly categorized into improved and unimproved types. [20] Although improved sources of domestic water supplies are more likely to supply safe drinking water than unimproved ones, it has been shown that this is not always the case, for not all improved sources of water are safe. [21] In general, piped water is usually regarded as safe. [22] Sources of safe domestic water supplies in the five communities include treated surface water, as well as untreated but uncontaminated water from sources such as natural springs and sanitary wells and protected boreholes. Other sources include untreated water from streams, springs, ponds, rivers, lakes and rainwater.

In 2008, in Nigeria it was reported that less than 30% of the people had access to safe drinking water. [23] However, five years on, statistics from NDHS 2013 showed that access to safe domestic water supply had attained a new height, with 59.6% of the population having access. Statistics have also shown that 54.4% of the rural households in Nigeria (52.6% of the population) spent less than 30 minutes on round-trips, while 27.6% of the households (27.8% of the population) took longer than 30 minutes to complete the round-trip. [10]

The present study has demonstrated that mean access (roundtrip time) to domestic water supplies in the five rural communities of Enugu State was 15.38 minutes, meaning that 100% of the households in the five communities spent less than 30 minutes to complete the roundtrip. This implies that these communities had basic access to safe

domestic water supplies as defined by WHO (i.e. less than 30 minutes round trip time).

[20] This finding is in sharp contrast with what had been earlier reported by. [10] However, good access to improved domestic water supply in the five communities had not translated to overall improvement in their domestic water supply as shown by the other findings of the study, for access to safe domestic water supplies is not defined only by distance/time, but also the quantity of water consumed per person per day and the proportion of the population that use improved domestic water supplies.

Cost is another service indicator of safe domestic water supply considered in this study. The study has revealed that the average monthly cost of domestic water supplies in the five communities of Enugu state was ₦—1172. The mean cost of domestic water supplies in the five communities as found in the study was higher than what had been reported by. [24] Between access to domestic water supplies and cost of domestic water supplies, the study found a positive and strong ($r=0.77$) correlation, although this was not significant ($p=0.13$).

The rising cost of provision of domestic water supplies as demonstrated in this study could, on the one hand, be attributed to lack of adequate provision of safe domestic water supplies for the people by the government and other stakeholders saddled with the task of providing the people with safe domestic water supply, and on the other hand be attributed to seasonal fluctuation as the cost rises commensurately in dry season, which coincides with the period of scarcity. Also continuity of supply, which is another service indicator of

safe domestic water supply (although not considered in the study), appears to play a significant role in determining the cost of domestic water supply. When the continuity cannot be guaranteed, supply will be scarce and consequently the cost will be higher. The affordability of water has a significant influence on the use of water and selection of water sources. Rising cost of domestic water supplies can have a determinant effect on the quantity and quality of water available to a household, sometimes decreasing proportionately and impacting on the hygiene level as a result. Also high cost of domestic water supply, decreasing quantity and quality of domestic water supplies can act as potential triggers for the development of various types of water-related diseases.

Access to domestic water supplies and costs of provision of domestic water supplies may be among the factors that determine the per capita daily water use. The amount of water use per person per day varies with the distance from water source and climate, decreasing as the distance increases. [25] The National Policy on Water and Sanitation of 2000 prescribes a consumption standard of 30 litres per person per day in the rural areas, 60 litres in the semi-urban areas and 120 litres in the urban areas. [17]

In the present study, a mean per capita daily water consumption of 22.1 litres was found in the five communities. The correlation between access to domestic water supply and daily per capita water use in these communities was moderate and negative ($r = -0.59$), but not significant ($p = 0.29$). Between cost of domestic water supply and daily per capita water use, the correlation was very strong and negative ($r = -0.99$), although not significant ($p = 0.11$). This finding clearly indicates that the five communities did not meet the stipulated minimum quantity of 30 litres per person per day for rural dwellers, according to the National Policy on Water and Sanitation of 2000. Furthermore, the correlations between daily per capita water use, access to

domestic water supplies and cost of domestic water supplies imply that the daily per capita water use in these communities decreases as both access time and cost of domestic water supplies increase. Consequently, the low per capita daily water use found in this study could be attributed to the rising cost which made it impossible for the households in these communities to afford enough water per person per day for domestic purposes.

CONCLUSION

With a per capita daily water use of less than 30 litres and rising cost of domestic water supplies, Enugu State could not attain in 2015 the MDG target of achieving 75% access to safe drinking water for the population, in spite of having basic access (within 1 km and less than 30 minutes) to sources of domestic water supplies. The other indicators of provision of safe drinking water-quality and continuity- are most likely to be also poor. This situation in the communities of Enugu State, which probably exists in other states of the country, might all have contributed to Nigeria's inability to achieve the 2015 MDG target as concerns provision of safe drinking water for the people. It is therefore recommended that the Government of Nigeria in general and Enugu State in particular pursue with vigor the targets of 'vision 2020' in the area of domestic water provision, which if well implemented will guarantee adequate provision of affordable safe domestic water for the people by 2020.

Declarations

Funding: None

Conflict of interest: None declared

Ethical approval: Not required

REFERENCES

1. Ganong W F. Review of Medical Physiology. 22nd ed. Singapore: McGraw-Hill; 2005.
2. Shakhashiri P. Chemical of the week: Water. 2011[Internet]. [cited 2014 September 9]. Available from <http://www.scifun.org>.

3. World Health Organization. Making a difference. The World Health Report 1999. Geneva: WHO; 1999
4. World Health Organization. Water supply, 2002 [Internet]. [cited 2014 September 9]. Available from <http://www.who.int/.../em2002chap7.pdf>.
5. World Health Organization. Guidelines for drinking-water quality. 2nd ed. Geneva: WHO; 1997.
6. United Nations General Assembly. The human right to water and sanitation: Resolution 64/292, 2010. [Internet]. [cited 2014 September 12]. Available from <http://www.un.org>waterforlifedecade>hum...>
7. Water and Sanitation Monitoring Platform. Water and sanitation sector performance report, 2010. [Internet]. [cited 2014 September 16]. Available from <http://www.washghana.net/content/download/...>
8. World Health Organization and United Nations Children's Fund. Joint monitoring programme for water supply and sanitation: Progress on drinking water and sanitation, 2012. [Internet]. [cited 2014 September 16]. Available from <http://www.unicef.org/.../JMPreport2012.pdf>.
9. Pan Africa Chemistry Network. Africa's water quality, 2010.[Internet]. [cited 2014 September 20]. Available from http://www.rsc.org/images/RSC_PACN_water_r...
10. National Population Commission Federal Republic of Nigeria. Nigeria demographic and health survey 2013, 2013 [Internet]. [cited 2014 October 1]. Available from <http://www.population.gov.ng/index.php/201...>
11. Nigeria Core Welfare Indicators Questionnaire Survey, 2006 [Internet]. [cited 2014 October 1]. Available from <http://catalog.ihnsn.org>Home>IHSN Survey Catalog>.
12. National Population Commission Federal Republic of Nigeria. Nigeria Demographic and Health Survey 2008, 2009 [Internet]. [cited 2014 October 4]. Available from <http://dhs.programme.com/.../FR222.pdf>.
13. Humanitarian Charter and Minimum Standards. Personal and institutional roles in the provision of potable domestic water supply, 2003 [Internet]. [cited 2014 October 4]. Available from <http://myweb.ewb-usa.org/theme/library/myewb->.
14. Lucas A O, Gilles H M. Short Textbook of Medicine for the Tropics. 4th ed. London: Arnold; 2003.
15. Dickie P. Rich countries, poor water, 2006 [Internet]. [cited 2014 October 4]. Available from http://www.panda.org/download-downloads/rich_countr..
16. Chenoweth J. Minimum water requirement for social and economic development, 2011 [Internet]. [cited 2014 October 4]. Available from <http://epubs.survey.ac.uk/7676/49/minimum...>
17. Federal Ministry of Water Resources. National water and sanitation policy, 2000 [Internet]. [cited 2014 October 7]. Available from <http://www.nwri.gov.ng/userfile/Nati...>
18. Vision 2020 National Technical Working Group. Report on Water and Sanitation, 2009 [Internet]. [cited 2014 October 7]. Available from <http://www.npc.gov.ng/vault/files/water%20and20sanitation%20ntwg%20report.pdf>.
19. National Population Commission. Report of Nigeria's National Population Commission on the 2006 Census, 2006 [Internet]. [cited 2014 October 10]. Available from <http://www.jstor.org/stable/25434601>.
20. World Health Organization. Guidelines for Drinking Water Quality. 4th ed. Geneva: WHO; 2011.
21. Olajuyigbe A E, Rotowa O O, Adewumi I J. Water vending in Nigeria-A case study of FESTAC town, Lagos, Nigeria. *Med J Soc Sc.* 2012; 3(1): 229-239.
22. Sullivan C A, Meigh J R, Giacomello A M et al. The Water Poverty Index: development and application at the community level. *Nat Res Forum.* 2003; 27: 189-199.

23. Hellandendu J M. Health implications of water scarcity in Nigeria. *Eur Sc J.* 2012; 8(18): 111-117. <http://www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations>
24. National Bureau of Statistics. Consumption pattern in Nigeria 2009/2010, 2012 [Internet]. [cited 2014 October 7]. Available from
25. Moe CL, Rheingans R D. Global challenges in water, sanitation and Health. *J Water and Health.* 2006; 04 suppl.

How to cite this article: Umegbolu EI. Service indicators (coverage/access, quantity, and cost) of safe domestic water supply in selected communities of Enugu state, southeast Nigeria and 2015 water related MDG: a survey study. *Int J Health Sci Res.* 2017; 7(5):273-281.
