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Tackling Household Risk Behaviors as Potential Challenges in Strengthening Primary Health Care in Resource-Constrained Settings: A Cross-Sectional Study

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Abstract

Introduction: Strengthening primary health care in resource-constrained settings is crucial to achieving the rapid and equitable scale up for the delivery of essential interventions. This study aims to elucidate the ecological context of study sites about water and sanitation and risk of non-communicable diseases (NCDs) (NCDs) in Hlegu Township, Myanmar; Gain insight on access to safe drinking water and sanitation-related practices, and estimate the potential risk behaviors linking to (NCDs).

Methods: A cross-sectional survey conducted between December 2015 and January 2016 covered random selection of 235 households from 5 urban wards and 473 households from 16 villages in Hlegu Township. A multilevel two-way stratification was used as the sampling procedure. Trained interviewers introduced the structured questionnaire to one eligible female respondent per household. Cross-tabulations were done for bivariate analyses. Prevalence ratios and 95% confidence intervals were computed to examine the potential risk behaviors.

Results: Households in urban wards mostly used piped-in water supply whereas tube wells and unprotected shallow wells were the drinking water sources in rural study sites. Small shops selling cigars and liquor were higher in urban wards compared to rural study sites (319 *vs* 100 and 45 *vs* 33). Rural households were more likely to keep drinking water in traditional earthen pots compared to urban sites (85% *vs* 42%). Nearly 24% of the combined sample disposed excreta of under-five children into nearby water bodies together with unsafe solid waste. Rural households were less likely than their urban counterparts to perform desirable actions in water storage. Both rural and urban households currently reported more or less similar prevalence rates of alcohol drinking (around 20%), smoking (<25%), and beetle chewing (<40%).

Conclusions: Intensive awareness-raising campaigns by innovative approaches integrated in support of water safety plan and reducing NCDs are highly desirable to tackle the multiple risk behaviors in households.

Keywords: Safe drinking water; Sanitation; Potential risk behaviors; NCDs; Primary health care; Myanmar

Abbreviations: CDs: Communicable Diseases; NCDs: Non-Communicable Diseases; LMIC: Low and Middle-Income Countries; PHC: Primary Health Care; UHC: Universal Health Coverage; KAP: Knowledge, Attitude, and Practice survey; KOFIH: Korea Foundation for International Health Care

Introduction

The nexus of communicable and non-communicable diseases (NCDs) poses a challenge for low- and middle-income countries (LMIC). Globally, there is an urgent need for more than 400 million people to transform the delivery of essential health services through primary health care (PHC) [1,2]. The approach using PHC plays a significant role in the prevention of communicable disease outbreaks, improvement of the health of women and children and management of the rising burden of non-communicable diseases (NCDs) [3-8]. On the other-hand, non-communicable diseases (NCDs) are on the rise in both urban and rural areas of LMIC [9]. To date, there is an increase in access to safe water and sanitation in LMIC, thereby epidemiological transition is apparent as a shift away from infectious, parasitic and nutritional diseases to non-communicable diseases (NCDs) [6]. The outputs of the National Universal Health Coverage (UHC) consultation meeting in July 2012 in Myanmar addressed the need for health system strategies for the prevention and control of communicable and non-communicable diseases (NCDs) apart from provision of quality services focusing on women and children [10]. The expansion of an investment in PHC strategy is imperative in developing

regions including Myanmar and necessary public health actions require guidance through evidence-based findings so as to mitigate urban and rural disparities [4-6]. Strengthening primary health care within the township health systems in resource-constrained settings is crucial to achieve the rapid and equitable scale up for the delivery of essential interventions toward prevailing health problems while moving towards the sustainable development goals. Socio-environmental drivers have favored risk behaviours related to water and sanitation in the households inclusive of sources, water storage, treatment and use behaviours especially concerning drinking water, use of sanitary latrines, disposal of excreta of under-five children and sanitary waste disposal [11]. Moreover, life-style related risk behaviours on tobacco and alcohol use in households might have an impact on the occurrence of non-communicable diseases (NCDs) such as chronic respiratory disorders, cardiovascular diseases, diabetes and cancer [12]. To date,

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little is known about the composite risk behaviors for communicable as well as non-communicable diseases (NCDs) at the household level in LMIC to promote preventive interventions. The objectives of the study were to elucidate the ecological context of urban wards and villages in relation to water and sanitation risk and the risk of non-communicable diseases (NCDs) in Hlegu Township, Myanmar; gain an insight into household risk behaviors related to safe drinking water and sanitation; and estimate the household risk behaviors linking to non-communicable diseases (NCDs).

Methods

Study design

A cross-sectional survey was conducted between December 2015 and January 2016. This was a preliminary study before implementing primary health care system strengthening interventions [13].

Study area and study population

The study area is Hlegu Township, Yangon Region located between 17°9' north and 96°19' East and 45 kilometers northeast of Yangon city. The estimated total population is approximately 2.69 million as of 2014 [14] and has an agro-based economy. Monsoon usually starts in the third or fourth week of May, and every year, seasonal floods affect the access to health services and contamination of water sources.

Health care delivery setting

Yangon Regional Health Department has initiated the six-year project on primary healthcare system strengthening in Hlegu Township since 2014 in collaboration with Korea Foundation for International Health Care (KOFIH) [13]. One of the project components is to develop the water safety plan and to conduct the intensive community engagement activities to promote awareness of prevention of communicable as well as non-communicable diseases (NCDs).

Sample size and sampling

The sample size for the survey was computed based upon the Slovin's formula [15] of n=N/(1+N × e2). n=sample size; N=Universal population [total population of the coverage area]; e2=Margin of error [square root of 2]; 1=given as part of the standard formula. The formula took into account of the total population of 269,522 estimated in 2014 [14] and the urban and rural ratio of 1:2. Therefore, the sample size for the urban wards was 200 households and for the rural villages, the sample covered 400 households at 95% confidence level and 5% marginal error. For the community-based survey, a multilevel, two-way stratified sampling procedure was used to allow the survey team to attain the unbiased estimates from the non-overlapping sub populations [16]. In the first stage, 4 out of 8 rural health centres (RHC) were chosen by stratification (2 RHCs distant from Hlegu Township Hospital of more than one hour travel by any means and the equal number of RHCs in proximity to the Township Hospital) considering for the referral chain during medical emergencies. In the second stage, eight villages with sub-centres and the equal number without any sub-center within the jurisdiction of 4 selected RHCs were included at random. The selection of villages was based on the list prepared at the Township Health Department to provoke the equal chance in selection and to avoid over and under sampling. Finally, 28-30 households with at least one child under five years per village have been chosen at random from the available sampling frame (immunization registers of midwives validated by local administrative authorities at the time of survey) totaling 473 eligible respondents for rural surveys. For the

urban area, five wards were included. For each ward, 45-49 households with at least one child under five years were selected at random totaling 235. Households in different communities have a different likelihood of selection. However, socioeconomic context of urban wards and villages are more or less the same in that township. Therefore there was a minimal chance for selection bias.

Data collection methods

For the village survey, the research team leader interviewed one administrative authority together with one influential person in the selected ward/village to collect the contextual information concerning with community risk behaviors. A pre-tested pro forma covered the number of households, population resided, seasonal proneness to floods, sources of drinking water according to climatic conditions, sanitation and waste disposal facilities, referral mechanisms in case of medical emergencies, number of shops selling cigarette and liquor, and number of private health facilities/unlicensed practitioners/traditional birth attendants.

For the household survey, the eligible respondent in each selected household was recruited. The eligibility was determined as a woman giving birth to a child within past five years and age between 18-45 years. Six trained interviewers conducted structured interviews by using the pre-tested and modified questionnaire. The questionnaire covered five components (sections A to E) and two components were related to the present study: section D-KAP on water, sanitation and hygiene and a checklist (Section E) to examine the water storage practices in households in support of water safety plan. In the household form, the respondent was asked about the life-style related risky habits of each household member >15 years of age. Current smoker, betel quid chewer, and alcohol drinker were operationally defined as those who engaged in behaviors as mentioned earlier within one month before the survey. The World Health Organization (WHO) has declared four main behaviours associated with NCDs: Physical inactivity, unhealthy diet, tobacco use and alcohol drinking. However, due to feasibility within project interventions in that area, the study focused only on two life-style related behaviors likely to be influenced by social and ecological context after discussion with township health authorities.

Data management

Data entry was carried out by EPI DATA version 3.0 and analyzed by SPSS version 22.0 (IBM, USA). The unweight data was used for analysis taking into account of the multilevel two-way stratification of study sites and random selection of households [16]. Frequency distributions and cross-tabulations of variables of interest were done. The estimated prevalence rates and 95% confidence intervals (CI) of current smokers, betel quid chewers, and alcohol drinkers were computed based on the population at risk (>15 years of age) in study households and compared between the study sites. The composite household risk behaviors related to safe drinking water and sanitation (households with unimproved water supply and insanitary latrine use) and NCDs (currently reported smoking, beetle chewing and alcohol drinking) were computed by transforming into a new variable. Four items were generated: No risk, water and sanitation risk only, NCD risk only and both. The chi-squared test was used to underscore the differences between the categorical variables and p-value ≤ 0.05 was considered significant.

Ethical Considerations

This study is part of the larger study of 'Primary Health Care Systems Strengthening in Hlegu Township at Yangon Region, Myanmar: Baseline Studies (2015-2016) approved by the Ethics Review Committee,

Department of Medical Research. Interviews were conducted following the written informed consent. Privacy, confidentiality and anonymity issues were taken into account according to Helsinki Declaration.

Results

Village/ward characteristics

There were 1,409 and 2,447 households in 16 villages with and without sub rural health centre resided by the estimated number of 6,069 and 10,688 persons respectively. In five urban wards, there were estimated 7,738 households resided by 37,891 persons. Altogether 4,080 under five children resided in urban and rural study sites. In the rural study sites, mostly cited sources for drinking water included tube wells and unprotected shallow wells whereas in urban wards, approximately one in three households used piped-in water supply. Sanitary latrine coverage ranged from 53% to 100% in rural study sites and 79% to 96% in urban study sites. There were small vendors selling cigars, three times higher in urban wards compared to rural study sites (319 vs 100). The estimated number of shops selling liquor was 33 in rural study sites and 45 in urban study sites. Seasonal floods were commonly reported in 7 out of 16 study villages and in 3 out of 5 urban wards that required attention for water source contamination.

Household characteristics

A total of 3,326 people resided in 708 study households, and the average household size varied from 2 to 14. The proportion of under-five children in the combined sample was 24.2%. Approximately 61.3% of surveyed households reported at least one household member with an earning capacity at the time of survey which was higher in rural than in urban study sites (64.6% and 66.5% vs 52.8%).

The household infrastructure and availability of communication amenities were described (Table 1). In rural households, poor structure made of bamboo was more likely to be common than in their urban counterparts (43.9% and 43.6% vs 25.5%). The mobile phone coverage in rural households was slightly lower than in the urban wards (83.5% and 80.5% vs 90.6%). Also, the coverage of television was lower in rural than in urban households (65.0% and 55.1% vs 67.4%). Some 57% of eligible respondents in the combined sample were women between 30-49 years of age with at least one child under five years of age. Their median age was 31 years and their age range varied from 18 to 49 years. Around 55% of the study population had low (not completed primary school) or no formal schooling and the respondents from the rural areas were more likely to attain a low level of education than those from the urban study sites (Table 2).

An access to drinking water sources and sanitation was reported. In urban wards, householders relied more on bottled water (purified water purchased for drinking purpose) while in rural households, tube wells remained as the major source of drinking water which seemed safe and protected. The overall coverage of sanitary latrines (household ownership) in both urban and rural sites was satisfactory (84%). But nearly 24% of the combined sample reported the disposal of excreta of under-five children into nearby water bodies such as ditches, ponds, lakes, disposed together with solid waste, and in the yard or outside the premises. Such activities provoked contamination of ground and surface water sources. For the solid waste disposal, householders reported burning as their popular means (47.9%). But they practiced several unsafe methods of disposal: At the open dumping site with an unsightly scene and disposed in nearby surface water bodies or haphazard means. The composite risk of unimproved water sources and poor sanitation was significantly higher in rural households compared to households from rural study sites (67.9% and 62.3% vs 37.7%) (Table 3).

Drinking water storage patterns and purification practices were analyzed (Table 4). Drinking water was mostly kept in traditional earthen pots two times more likely in rural sites compared to urban sites (85% vs 42%). Study households from urban sites stored drinking water in purified water containers with taps (66%) and this type of containers were subjected to contamination if left unchanged for a long time. As for the purification of drinking water, boiling was aware mostly by urban householders (72%) whereas filtration by cloth was mostly aware in rural households (89%). The use of chlorine tablets was not aware by the majority of respondents (10%). In the combined sample, over 80% knew how to treat their drinking water. However, only 46% of urban households reported boiling. In contrast, 86% of rural households used cloth filter which provoked contamination. Moreover, contamination was possible in drinking water cups mostly glass, or a plastic/steel cups. Of four common types of water storage containers, householders were less likely to cover cement drums compared to other types both in-door and out-door in the combined sample (29% vs 26%). In addition, householders were less likely to change water (50% vs 62%) from cement tanks and clean (37% vs 61%) within seven days. Rural households were less likely to perform those two desirable actions than urban households.

The study households in the combined sample reported the presence of one to three current smokers (just over half), one to ≥ four current beetle chewers (just over 75%) and one to three current drinkers (just about half) (Table 5). Rural households from villages without sub-centers were more likely to report beetle chewers compared to

Characteristic	Villages with sub-center	Villages without sub-center	Urban wards	Total
	n=237	n=236	n=235	n=708
Type of housing				
Pucca	7 (3.0)	9 (3.8)	34 (14.5)	50 (7.1)
Semi-pucca	25 (10.5)	13 (5.5)	43 (18.3)	81 (11.4)
Wooden	101 (42.6)	111 (47.0)	98 (41.7)	310 (43.8)
Bamboo	104 (43.9)	103 (43.6)	60 (25.5)	267 (37.7)
Communication amenities[†]				
Radio	24 (10.1)	21 (8.9)	22 (9.4)	67 (9.5)
Television	154 (65.0)	130 (55.1)	193 (82.1)	477 (67.4)
Mobile phone	198 (83.5)	190 (80.5)	213 (90.6)	601 (84.9)
Landline phone	1 (0.4)	0 (0.0)	6 (2.6)	7 (1.0)
Percentages are shown in parentheses; [†]Column percentages do not add up to 100 due to single item response				

Table 1: Household infrastructure and communication amenities by study site, Hlegu Township, Yangon Region, 2015-2016.

Characteristic	Villages with sub-center	Villages without sub-center	Urban wards	Total
	n=237	n=236	n=235	n=708
Age group(in years)				
<20	1 (0.4)	4 (1.7)	10 (4.3)	15 (2.1)
20-29	114 (48.1)	105 (44.5)	73 (31.1)	292 (41.2)
30-39	87 (36.7)	101 (42.8)	114 (48.5)	302 (42.7)
40-49	35 (14.8)	26 (11.0)	38 (16.2)	99 (14.0)
Education level				
No formal schooling	20 (8.4)	13 (5.5)	6 (2.6)	39 (5.5)
Low formal school	83 (35.0)	96 (40.7)	52 (22.1)	231 (32.6)
Completed primary	63 (26.6)	37 (15.7)	20 (8.5)	120 (16.9)
Some secondary	37 (15.6)	44 (18.6)	49 (20.9)	130 (18.4)
Completed secondary	9 (3.8)	11 (4.7)	8 (3.4)	28 (4.0)
Higher education	20 (8.4)	21 (8.9)	33 (14.0)	74 (10.5)
Completed higher education and university	5 (2.1)	14 (5.9)	67 (28.5)	86 (12.1)
Percentages are shown in parentheses				

Table 2: Respondents characteristics in study households, Hlegu Township, Yangon Region, 2015-2016.

Characteristic	Villages with sub-center	Villages without sub-center	Urban wards	Total
	n=237	n=236	n=235	n=708
Source of drinking water[†]				
Tube well	127 (53.6)	97 (41.1)	82 (34.9)	306 (43.2)
Protected dug well	30 (12.7)	26 (11.0)	0 (0.0)	56 (7.9)
Unprotected dug well	23 (9.7)	46 (19.5)	1 (0.4)	70 (9.9)
Rain water	11 (4.6)	24 (10.2)	8 (3.4)	43 (6.1)
Surface water	19 (8.0)	36 (15.3)	13 (5.5)	68 (9.6)
Bottled water	38 (16.0)	22 (9.3)	193 (82.1)	253 (35.7)
Latrine				
Sanitary fly proof	208 (87.8)	180 (76.3)	207 (88.1)	595 (84.0)
Not fly proof latrine	24 (10.1)	49 (20.8)	26 (11.1)	99 (14.0)
Open defecation	5 (2.1)	7 (3.0)	2 (0.9)	14 (2.0)
Disposal of under-five excreta[†]				
Toilet facility	162 (68.4)	182 (77.1)	192 (81.7)	536 (75.7)
Water bodies	18 (7.6)	15 (6.4)	31 (13.2)	64 (9.0)
Solid waste/trash	3 (1.3)	4 (1.7)	10 (4.3)	17 (2.4)
In the yard	40 (16.9)	40 (16.9)	22 (9.4)	102 (14.4)
Outside premises	32 (13.5)	13 (5.5)	5 (2.1)	50 (7.1)
Buried	0 (0.0)	4 (1.7)	0 (0.0)	4 (0.6)
Waste disposal				
Buried	7 (3.0)	3 (1.3)	1 (0.4)	11 (1.6)
Burning	143 (60.3)	139 (58.9)	57 (24.3)	339 (47.9)
At the dumping site	25 (10.5)	45 (19.1)	108 (46.0)	178 (25.1)
Into water bodies	54 (22.8)	51 (21.6)	51 (21.7)	156 (22.0)
Haphazard	26 (11.0)	14 (5.9)	48 (20.4)	88 (12.4)
Percentages are shown in parentheses; [†]Column percentages do not add up to 100 due to single item response				

Table 3: Access to drinking water sources and sanitation, Hlegu Township, Yangon Region, 2015-2016.

Characteristic	Villages with sub-center	Villages without sub-center	Urban wards	Total
	n=237	n=236	n=235	n=708
Drinking water storage[†]				
Ceramic jar	3 (1.3)	8 (3.4)	0 (0.0)	11 (1.6)
Steel container	1 (0.4)	0 (0.0)	8 (3.4)	9 (1.3)
Purified water bottle	9 (3.8)	18 (7.6)	25 (10.6)	52 (7.3)
Drinking water pot	202 (85.2)	201 (85.2)	99 (42.1)	502 (70.9)
Purified water container with tap	33 (13.9)	26 (11.0)	156 (66.4)	215 (30.4)

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Others	1 (0.4)	3 (1.3)	5 (2.1)	9 (1.3)
Awareness of water purification methods†				
Boiling	95 (40.1)	84 (35.6)	169 (71.9)	348 (49.2)
Cloth filter	212 (89.5)	210 (89.0)	158 (67.2)	580 (81.9)
Add chlorine or bleach	29 (12.2)	18 (7.6)	24 (10.2)	71 (10.0)
Sedimentation	53 (22.4)	60 (25.4)	61 (26.0)	174 (24.6)
Alum	8 (3.4)	6 (2.5)	7 (3.0)	21 (3.0)
Filtration	5 (2.1)	1 (0.4)	9 (3.7)	15 (2.1)
Don't know	1 (0.4)	3 (1.3)	2 (0.9)	6 (0.8)
Treat drinking water				
Yes	215 (90.7)	223 (94.5)	171 (72.8)	609 (86.0)
Methods used†				
Boiling	63 (26.6)	44 (18.6)	107 (45.5)	214 (30.2)
Cloth filter	204 (86.1)	206 (87.3)	87 (37.0)	497 (70.2)
Add chlorine or bleach	4 (1.7)	3 (1.3)	3 (1.3)	10 (1.4)
Sedimentation	47 (19.8)	43 (18.2)	27 (11.5)	117 (16.5)
Alum	4 (1.7)	3 (1.3)	3 (1.3)	10 (1.4)
Don't know	0 (0.0)	3 (1.3)	3 (1.3)	6 (0.8)

Percentages are shown in parentheses; †Column percentages do not add up to 100 due to single item response

Table 4: Drinking water storage patterns and purification, Hlegu Township, Yangon Region, 2015-2016.

Household risk behaviors	Villages with sub-center	Villages without sub-center	Urban Wards	P values
Total	n = 237	n = 236	n = 235	-
Current smokers				
None	127 (53.6)	111 (47.0)	104 (44.3)	-
One	100 (42.2)	112 (47.5)	114 (48.5)	-
Two & above	10 (4.2)	13 (5.5)	17 (7.2)	0.255
Current beetle chewers				
None	65 (27.4)	45 (19.1)	57 (24.3)	-
One	125 (52.7)	142 (60.2)	120 (51.1)	-
Two	41 (17.3)	42 (17.8)	47 (20.0)	-
Three & above	6 (2.5)	7 (3.0)	11 (4.7)	0.134
Drinkers				
None	127 (53.6)	109 (46.2)	122 (51.9)	-
One	107 (45.1)	119 (50.4)	108 (46.0)	-
Two & above	3 (1.3)	8 (3.3)	5 (2.1)	0.33
Estimated prevalence and 95% CI				
At risk population (>15 years)	593	638	659	-
Sum of current smokers	121	142	152	-
% current smokers	20.4	22.3	23.1	-
95% confidence interval	(17-24)	(19-26)	(20-26)	-
Sum of beetle chewers	226	252	249	-
% current beetle chewers	38.1	39.5	37.8	-
95% confidence interval	(34-42)	(36-43)	(34-42)	-
Sum of drinkers	113	137	118	-
% current drinkers	19.1	21.5	17.9	-
95% confidence interval	(16-22)	(18-25)	(15-21)	-

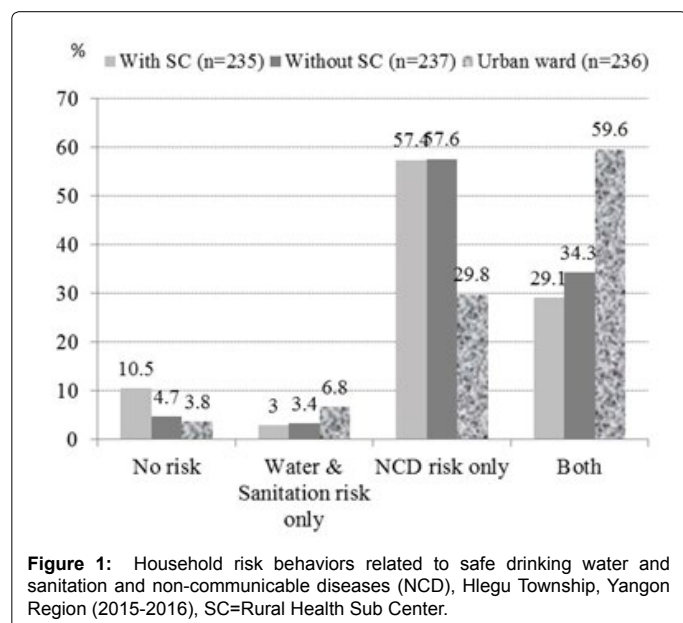Percentages and 95% CI are shown in parentheses.

Table 5: Household risk behaviors linking to non-communicable diseases, Hlegu Township, Yangon Region 2015-2016.

their urban counterparts (81% *vs* 76%). Among the estimated at-risk population of age ≥ 15 years around 1,890 in study households, the prevalence of current beetle chewers was higher than current smokers and alcohol drinkers (38.5% *vs* 22% and 19.5% respectively). Overall, the reported prevalence rates of current smoking (<25%), current beetle chewing (<40%) and current alcohol drinking (around 20%) between rural and urban households were more or less the same.

Household risks for both communicable and non-communicable diseases (NCDs) were identified more in urban study sites (60%) compared to villages (<35%) (Figure 1).

Discussion

Thus, this study demonstrates the estimated prevalence of multiple risk behaviours which is critical before the adoption of effective health

Figure 1: Household risk behaviors related to safe drinking water and sanitation and non-communicable diseases (NCD), Hlegu Township, Yangon Region (2015-2016), SC=Rural Health Sub Center.

promotion measures directed towards households in vulnerable sites.

Ecological context and household risk behaviours related to unsafe drinking water and poor sanitation

Seasonal floods in nearly half of the study sites influenced the contamination of drinking water sources especially unimproved (unprotected shallow wells, ponds, lakes) exacerbated by insanitary latrines, improper disposal of children's excreta, and improper solid waste disposal. Moreover, container mismanagement practices were likely to be associated with an increased chance of dengue vector breeding and occurrence of diarrhoea especially in fewer than five children as reported by other studies from Myanmar and elsewhere [17,18].

Ecological context and household risk behaviours linking to non-communicable diseases (NCDs)

Easy accessibility and availability of cigarettes, smokeless tobacco products (betel quid) and alcohol (in the form of beer or country spirit) from small shops and roadside vending in both urban and rural study sites favoured risky habits. These sites should be noted to disseminate health education messages related to prevention of common NCDs to their regular customers. Those risky habits were evident by the reported behaviours of a population at risk (>15 years of age) from study households as current cigarette smokers, betel quid chewers and alcohol drinkers ranged from one to three or four persons per household (Table 5). One recent study reported the higher proportion of alcohol drinkers in rural than in urban sites of Yangon region [19].

A nexus of CD and NCD linked risk behaviours at household level

Households in study sites shared common risk behaviours for safe drinking water and sanitation and non-communicable diseases (NCDs) (Figure 1) that is having access only to unsafe source of drinking water and insanitary excreta disposal, tobacco use and alcohol drinking. The co-occurrence of environment and lifestyle-related behaviours in vulnerable populations might pose an additional strain on health systems that require major reforms [1,20]. An integrated approach to promoting health literacy by community engagement is pre-requisite

while implementing the health education program as planned by Hlegu Township Health Department in collaboration with KOFIH (The Korea Foundation for International Healthcare).

Limitations

There is a possibility of underreporting of smoking, betel quid use and alcohol drinking in selected households due to the responses relied only to an eligible female respondent and not the individual household members. Heavy alcohol drinking carries social stigma in Myanmar that might result in under-reporting of drinking behaviours in this survey.

Conclusions

Both urban and rural households in study sites revealed the co-occurrence of multiple risk behaviours in an enabling environment but not high. There was an additional requirement for awareness raising and provision of integrated health services for CDs and NCDs at different levels of the township health system. Intensive awareness rising campaigns by innovative approaches integrated in support of water safety plan and reducing NCDs are highly desirable to tackle the multiple risk behaviors. Translating research evidences into action is critical to strengthen township micro planning efforts. Opportunities and building partnerships with bilateral and multilateral donor agencies, development agencies and implementing community engagement strategies in support of water safety plan and NCD prevention would be promising for the public sector health services in Myanmar to leverage and navigate for health systems strengthening. Further implementation research by using a mixed methods approach in this scenario will adequately reveal the challenges and pragmatic solutions for future scaling up of health promotion activities and sustained responses.

Availability of Data and Materials

The dataset used and analysed for this study will be made available on reasonable request to the corresponding author. The observation checklist and the interview questionnaire are in Myanmar language.

Authors' Contributions

KTW and TMM designed and coordinated the study; PAN and KLS conducted the field survey; TMM, PAN, KLS did literature review, data management and analysis; KTW and TMM did the overall write-up and all authors contributed to subsequent revisions and have approved the final version.

Ethics Approval and Consent to Participate

The research protocol for the larger study was submitted to and approved by the Ethics Review Committee, Department of Medical Research, and Myanmar. The necessary permissions and approvals were obtained from the administrative authorities. All study participants recruited were thoroughly explained about the study objectives and implications and voluntary informed consent was obtained in written format.

References

1. Remais JV, Zeng G, Li G, Tian L, Engelgau MM (2013) Convergence of non-communicable and infectious diseases in low- and middle-income countries. Int J Epidemiol 42: 221-227.

2. UNEP (2016) Healthy environment healthy people, thematic report, ministerial policy review session. second session of the united nations environment assembly of the united nations environment programme Nairobi, 23-27 May

2016, Kenya.

3. WHO (2015) Bill and Melinda Gates Foundation, World Bank Group, New partnership to help countries close gaps in primary health care, New York, USA.

4. Frenk J (2009) Reinventing primary health care: The need for systems integration. Lancet 374: 170-173.

5. Bhatia M, Rifkin S (2010) A renewed focus on primary health care: Revitalize or reframe? Global Health 6: 13.

6. Bhatia M, Rifkin S (2013) Primary health care, now and forever? A case study of a paradigm change. Int J Health Serv 43: 459-471.

7. Liu L, Johnson HL, Cousens S, Perin J, Scott S, et al. (2012) Global, regional, and national causes of child mortality: An updated systematic analysis for 2010 with time trends since 2000. Lancet 6736: 1-11.

8. Budhathoki SS, Bhattachan M, Yadav AK, Upadhyaya P, Pokharel PK (2016) Ecosocial and behavioral determinants of diarrhoea in under-five children of Nepal: A framework analysis of the existing literature. Trop Med Health 44: 7.

9. Ahmed SM, Hadi A, Razzaque A, Ashraf A, Juvekar S, et al. (2009) Clustering of non-communicable disease risk factors among selected Asian populations: Levels and determinants. Glob Health Action 28: 2.

10. UHC (2012) Consultation Meeting Report. Department of Health, Nay Pyi Taw, Myanmar.

11. Daniel D, Marks SJ, Pande S, Rietveld L (2018) Socio-environmental drivers of sustainable adoption of household water treatment in developing countries. NPJ clean water 1: 12.

12. Mujezinovic A, Calkic L, Hasanica N, Tandir S (2018) Tobacco and alcohol usage as risk factors of non-communicable diseases among students of Zenica University (Bosnia and Herzegovina). Medicinski Glasnik. 15: 81-86.

13. KOFIH (2015) Primary health care system strengthening in Hlegu Township at Yangon Region, Myanmar.

14. Department of Population (2015) The 2014 Myanmar population and housing census. The Union Report. Census Report, Myanmar.

15. UNICEF and OXFAM (2013) A study on current community access to and practices on water, sanitation and hygiene in select rural and urban settlements in Liberia.

16. Winkler WE (2001) Multi-Way survey stratification and sampling. Research report series. Statistical research division. U.S. Bureau of the Census, Washington D.C, USA.

17. Zaw PT, Wai KT, Oo T, Win Z, Thu HM, et al. (2012) Identifying requirements for targeted risk communication in prevention of dengue transmission in vulnerable sites, Mawlamyaing, Myanmar. Dengue Bull 36.

18. Overgaard HJ, Alexander N, Matiz MI, Jaramillo JF, Olano VF et al. (2012) Diarrhea and dengue control in rural schools of Columbia: Study protocol for a randomized controlled trial. Trials 13: 182.

19. Htet AS, Bjertness MB, Sherpa LY, Kjollesdal MK, Oo WM, et al (2016) Urban-rural differences in the prevalence of non-communicable diseases risk factors among 25-74 years old citizens in Yangon Region, Myanmar: A cross sectional study. BMC Public Health 16: 1225.

20. Blakely T, Hales S, Keift C, Wilson N, Woodward A (2005) The global distribution of risk factors by poverty level. Bull World Health Organ 83: 118-126.