

Original Research Article

COVID-19 risk behaviors in humanitarian settings: a cross-sectional study among conflict refugees in Uganda

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ABSTRACT

Background: Worldwide, behavioral change interventions are at the core of prevention efforts to contain the novel Corona Virus (COVID-19). While the evidence base to inform such interventions in the general population is growing, equivocal research in humanitarian populations is lacking. The current study describes the nature, extent and predictors of COVID-19 risk behaviors among conflict refugees in Uganda in a bid to inform prevention strategies for humanitarian settings.

Methods: Cross-sectional survey data on COVID-19 risk-behaviors, demographic, socio-economic, behavioral and clinical variables was gathered from 1014 adult refugees drawn from 3 refugee settlements in Uganda, using two-staged cluster sampling. Data was analyzed using t-test, Analysis of Variance (ANOVA) and Multivariable Linear Regression.

Results: Many refugees (25-70%) were involved in hygiene, congestion and nutritional/physical activity related risk behaviors likely to contribute to community transmission of COVID-19. Refugees living in rural settlements, of male sex, young age and low socio-economic status were at heightened risk of exposure to COVID-19 risk behaviors. Physical activity and healthy nutritional practices reduced the likelihood of COVID-19 risk behavior. Indulgence in COVID-19 risk behaviors increased the risk of developing COVID-19 symptoms.

Conclusions: COVID-19 risk behaviors among conflict refugees in Uganda are multifaceted in nature, widespread in extent and associated with symptom development, signaling for high risk for COVID-19 transmission in humanitarian settings. The data on predictors of COVID-19 risk behaviors have unmasked underlying inequalities, holding promise for development of evidence-based interventions to meet the needs of most vulnerable clusters in the refugee community.

Keywords: COVID-19, Risk-behaviors, Predictors, Humanitarian populations, Uganda

INTRODUCTION

The novel Corona Virus (COVID-19) was declared a global pandemic on 30th January 2020 and by the end of the year the number of known cases globally stood at 81-

million, with a case fatality rate of 2.2%.¹ Across countries, the public health responses to the pandemic have at the core included the control of transmission risk through initiatives targeting behavioral change at individual, institutional and societal levels.²⁻⁵ Though the emergence

of vaccines on the market represent a rapid shift from behavioral to clinical prevention measures, projections indicate that access to such vaccines for the poorer countries may be distant due to a number of factors including high demands in the manufacturing countries, storage and other logistical difficulties.⁶ In Low and Middle Income countries thus, behavioral change interventions with the overarching aim to reduce community transmission remain crucial in prevention.⁷⁻⁹ Though the success of such behavioral change models is previously documented in epidemic control in general populations, their re-adaptation to account for differences in vulnerability at population level is motivated.¹⁰

With a current global population of 80 million, humanitarian populations are classified under vulnerable groups and there are several reasons to re-adapt population-wide interventions for relevance in this group. Firstly, humanitarian populations exhibit a range of unique problems attached to their recent history including post-crisis mental disorders and a myriad of psychosocial challenges manifest in fears of apprehension, risk of deportation, difficult living conditions, poor access to health and social services in host countries, language, administrative, financial and legal barriers, stigma associated with COVID-19 importation etc., and there is strong evidence demonstrating the impact of such challenges on the efficacy, acceptance and uptake of behavioural interventions.⁸⁻¹⁸ Secondly, humanitarian populations generally constitute a demographically, culturally and socially diverse group, and multiple studies support the notion that behavioral change interventions in such populations should be adapted for socio-cultural appropriateness if accessibility, acceptability and positive response to interventions is to be achieved.¹⁷⁻¹⁹

Uganda is among the top 5 humanitarian settings in the world, hosting over 1.3 million conflict refugees from neighbouring countries of Rwanda, Burundi, South Sudan and Democratic Republic.²⁰⁻²¹ These refugees are potentially at heightened vulnerability to COVID-19 due to poor living conditions, pre-existing mental and psychosocial challenges, like peers elsewhere.^{11-16,20-23} Using Uganda as an example, the current study was undertaken to investigate the extent, nature and determinants of COVID-19 risk behaviors in Humanitarian settings. Specifically, we set out to estimate and rank risk behaviors likely to lead to the spread of COVID-19 in Humanitarian settings, unmask any inequalities in such risk behaviors and investigate to investigate whether there is an association between COVID-19 risk-behavior COVID-19 symptoms. To the best of our knowledge, such data is lacking in humanitarian settings. Yet, the assessment of the nature, extent and predictors of diseases and health risk behaviors has previously been acknowledged in the literature as first steps in epidemic control.²⁴ Additionally, unpacking and addressing social and demographic inequalities in emerging diseases at an early stage is cost-effective as resources can be targeted where they are most needed in timely manner.²⁵

METHODS

Study site and population

We conducted the research at 3 refugee settlements across Uganda, hosting over 400,000 refugees. Kisenyi, refugee settlement, an urban refugee setting in the centre of Kampala, hosting over 70,000 refugees of Somali origin. The refugees live integrated with their host.

Kyaka refugee Settlement in the South Western part of Uganda, a rural refugee setting hosting multinational refugees from the Democratic Republic of Congo (DRC), Burundi and Rwanda totaling approximately 124,000 refugees. The refugees live rather segregated from their host but with freedom of movement and shared services.

Adjumani refugee settlement in North-West Nile Uganda, hosting about 214,000 refugees predominantly of South Sudanese nationality. The refugees live rather segregated from their host but with freedom of movement and shared services.

Study design

Cross-sectional survey data on various health and social indicators was gathered from 1014 refugees randomly selected from each of the study sites. For the current study, data on COVID-19 risk-behaviors, symptoms, demographic, social and behavioral indicators was of primary interest.

Sampling procedure

Participants were sampled using a two-staged cluster sampling procedure in each settlement. The first stage involved selecting clusters of zones in the main settlement using systematic random sampling with probability proportional to zone size (PPS). The second stage constituted systematic sampling of households in selected zones. Random numbers procedures were used to choose one adult household member (i.e. 15 years and above) from among all adults in the household to constitute the final participant. This procedure resulted in 1014 refugees, with the following distribution among the settlements: Adjumani n=342; Kyaka 354; Kisenyi n= 318.

Ethical consideration

Thirty Research assistant were trained to collect data using mobile tablets, as a Standard Operation Procedure (SOP) to reduce the risk of COVID-19 spread. The two-day long training-oriented trainees on the purpose of the study; ethical considerations; data collection methods and tools; COVID-19 prevention, symptoms, measures and precautions; and standard operating procedures (SOPs) in field work in light of COVID-19. The second day of the training involved piloting of the data collection tool among a purposively selected refugee sample of n=30 from zones neighboring but not included in the main study. Slight

adjustments were made to data collection tools after this exercise.

Informed consent was received from all participants and confidentiality provided as much as possible. The potential risk and benefits of the study were explained to all participants and in light of the heightened risk of COVID-19 transmission, we developed Standard Operational Procedures (SOPs) for protection of refugees as well as data collectors, guided by among others Safety and Security Strategy for COVID-19 of the World Health Organization (WHO) and Ministry of Health Guidelines of Uganda.

The study was approved by the Makerere University School of Public Health Institutional Review Board (MakSPH IRB) and the Ugandan National Council of Science and Technology (UNCST), the two bodies governing academic research in Uganda. Additionally, the Ministry of Health (MoH) and the Office of the Prime Minister, which is in charge of refugee affairs, gave clearance for execution of the study.

Data collection tools and study variables

Dependent variables

The dependent variable for the current study was COVID-19 risk behaviors, operationalized with a total of 24 items. These were sub-divided in hygiene-related risk (e.g. hand washing, sanitizer use, disinfecting surfaces etc.), congestion-related risk (e.g. traveling in taxis, buses etc.), physical activity/nutrition practices that are COVID-19 protective (e.g. exercising, sunbathing etc) and international exposure-related risk (e.g. interaction with foreign visitors) (Supplementary Table 1).

Participants were asked to indicate frequency of such behaviors on a likert scale ranging from 1 (never) to 5 (very often). The pool of items was developed by the research team with cross-disciplinary competences guided by several guidelines on COVID-19 e.g. those developed by World Health Organization, ICDC, Ministry of Health (MoH). Based on the individual items, indices were formed to represent a total scale for risk-behaviors and 4 Sub-scales of risk-behaviors/practices. These were calculated by totaling individual responses to the various items within each sub-scale. High scores on these scales represent higher risk. The sub-scales were tested for reliability using Cronbach's Alpha, with coefficients ranging between 0.44-0.68 (Table 1), reflecting sufficient reliability.²⁶

Independent variables

The independent variables in the current study included demographic, social, behavioral and clinical characteristics of participants, such as sex, age, marital status, religion, income, employment status, country of origin, urban/rural settlement, alcohol and substance use,

physical activity; and clinical symptoms related with COVID-19.

Table 1: Reliability estimates for Scales/sub-scales for COVID-19 risk-behaviours among participants.

Scale/Sub-scale (no. of items) Items	Cronbach's Alpha
Overall risk (24)	0.68
Hygiene related risk (9)	
Wash hands	
Use soap	
Use sanitizer	
Cover mouth when sneezing/coughing	0.61
Use mask	
Shake hands	
Touch face	
Touch surface	
Disinfect	
Congestion related risk (8)	
Visit congested place	
Visit congregation	
Travel taxi	
Travel bus	0.51
Travel boda	
Travel car	
Travel truck	
Social distance	
International exposure related (3)	
Travel outside Uganda	
Met traveler from outside Uganda	0.44
Left settlement	
Nutrition/physical activity (4)	
Exercise	
Eat fruits/veggies	0.55
Drink water daily	
Sun-bathe	

Data analysis

T-test and Analysis of Variance (ANOVA) were used to test for the bivariate analyses. Multivariable Linear Regression was used to apportion the relative contribution of each independent variable in explaining the variations in the dependent variables. For inclusion in the regression analyses, a conservative risk level $p < 0.1$ in the preceding bivariate analyses was applied. However, a statistical significance of $p < 0.05$ was assumed in the regressions analyses. Adjusted R-square and F-test were used for statistical inference in the regression models and Multicollinearity assessed using the Variance Inflation Factor (VIF).

RESULTS

Demographic characteristics of participants

As indicated in Table 2, study participants were equally distributed across study sites of Adjumani, Kyegegwa and Kisenyi. Majority of participants were of South-Sudanese,

Congolese or Somali origin, aged under 45 years (over 80%), of female sex (65%), Protestants (36%) and Moslems (30%). Regarding socio-economic status, many participants were unemployed (70%), in the low-income bracket (i.e. 57% earning less than 50,000 UGX per week)

and were uneducated (40%). Concerning behavioral characteristics, few participants were smokers (4%) or drank alcohol (7%). Forty four percent were inactive regarding physical exercise.

Table 2: Demographic, socio-economic, behavioural and clinical characteristics of participants.

Characteristic	Yes, N (%*)
Refugee settlement	
Adjumani (Rural)	342 (33.8)
Kyegegwa (Rural)	354 (35.0)
Kisenyi (Urban)	317 (31.2)
Nationality	
South Sudanese	343 (33.9)
Congolese	342 (33.8)
Somali	308 (29.8)
Rwandese	11(1.2)
Burundian	12 (1.2)
Other	3 (0.3)
Age (in years)	
15-24	220 (21.7)
25-34	355 (35.0)
35-44	254 (25.1)
45-54	84 (8.3)
55-64	67 (6.6)
65-74	25 (2.5)
75-84	8 (0.8)
Sex	
Female	318 (31.4)
Male	693 (68.4)
Religion	
Moslem	307 (30.3)
Catholic	188 (18.6)
Protestant	370 (36.5)
Adventist	49 (4.9)
Born Again	55 (5.4)
Jehovah Witness	6 (0.6)
Other	33 (3.3)
Occupation	
Employed	34 (3.4)
Self-employed	120 (11.9)
Unemployed	712 (70.3)
Student	113 (11.2)
Farmer	26 (2.6)
Other	6 (0.6)
Earnings per week	
Less than 50,000	577 (57.1)
50,000-100,000	87 (8.7)
100,000 - 200,000	35 (3.5)
Over 200,000	33 (3.3)
Highest Education Level	
No Education	407 (40.2)
Primary level	303 (29.9)
Secondary level	230 (22.7)
Tertiary or vocational	24 (2.4)

Continued.

Characteristic	Yes, N (%*)
University	46 (4.5)
Smoker	
Yes	38 (3.8)
No	970 (95.8)
Drink Alcohol	
Yes	72 (7.2)
No	931 (91.9)
Exercise	
Never	450 (44.4)
Once	175 (17.3)
2-3 times	258 (24.5)
4 times or more	127 (12.5)
Symptoms of COVID-19	
Cough	84 (8.3)
Sneezing	78 (7.8)
Running Nose	53 (5.2)
Sore throat	39 (3.9)
Difficulty in breathing	37 (3.7)
Feeling weak and/or bodily pain	279 (28)
Lost sense of smell	40 (4.0)
Lost sense of taste	45 (4.5)

* Percentages may not add up to 100% due to missing data.

Table 3: Frequency of COVID-19 related risk behaviours among participants.

Practices/Experiences	Never		Few times		Sometimes		Often		Very often	
	N	%	N	%	N	%	N	%	N	%
Wash hands	5	5.0	178	17.6	186	18.4	379	37.4	265	26.2
Use soap	7	0.7	159	15.7	205	20.2	402	39.7	240	23.7
Use sanitizer	720	71.8	72	7.1	103	10.2	76	7.5	41	4.1
Visit congested place	474	46.8	305	30.1	166	16.4	58	5.7	8	0.8
Visit congregation	690	68.1	200	19.7	89	8.9	26	2.6	8	0.8
Travel taxi	951	93.9	44	4.4	10	1.0	6	0.6	1	0.1
Travel bus	991	97.8	13	1.3	5	0.5	2	0.2	2	0.2
Travel boda	587	57.9	157	15.5	174	17.2	60	6.0	34	3.4
Travel car	955	94.3	29	2.9	21	2.1	8	0.8	0	0
Travel truck	1003	99.0	7	0.7	2	0.2	0	0	1	0.1
Travel outside Uganda	1003	99.0	6	0.6	1	0.1	2	0.2	1	0.1
Met traveler from outside Uganda	972	95.9	32	3.2	1	0.1	3	0.3	1	0.1
I cover mouth when sneezing/coughing	97	9.6	218	21.6	245	24.2	300	29.7	147	14.5
Use mask	63	6.2	187	18.5	206	20.3	315	31.1	239	23.6
Social distance	89	8.9	286	28.2	229	22.6	288	28.4	116	11.5
Shake hands	567	56.0	197	19.5	122	12.0	85	8.4	40	4.0
Touch face	155	15.3	325	32.1	293	28.9	157	15.5	83	8.2
Touch surface	123	12.1	293	28.9	261	25.8	207	20.4	128	12.6
Disinfect	536	52.9	161	16.0	160	15.8	127	12.5	26	2.6
Exercise	495	48.9	206	20.3	121	11.9	110	10.9	81	8.0
Eat fruits/veggies	101	10.0	218	21.5	319	31.5	259	25.6	116	11.5
Drink water daily	15	1.5	129	12.7	126	12.4	396	39.1	343	33.9

Continued.

Practices/Experiences	Never		Few times		Sometimes		Often		Very often	
	N	%	N	%	N	%	N	%	N	%
Sun-bathe	303	29.9	266	26.3	242	23.9	145	14.3	56	5.5
Left settlement	816	80.6	85	8.4	62	6.1	38	3.8	10	1.0
Met someone who left settlement	686	67.7	89	8.8	68	6.7	45	4.4	12	1.2

Symptoms of COVID-19

As indicated in Table 2, between 3-28% of the participants had over the past 14 days experienced at least one symptom associated with COVID-19, with almost one third (28%) experiencing feelings of weakness and/or bodily pain.

Risk behaviours/Practices

Up to 70% of participants were involved in at least 1 risk activity/behavior for COVID-19 transmission (Table 3). The majority of participants adhered to good practice of washing hands with water and soap, avoided congestion or congregational settings and the use of communal and commercial transport services such as passenger motorbikes (commonly known as Boda Boda), buses, taxis and trucks. However, critical areas of concern affecting 25-70% of refugees included poor use of sanitizers and disinfectants; poor adherence to social distancing, handshaking, sneezing/coughing improperly, rare use of

mask; and poor practice of immune boosting activities such as exercise and poor nutritional habits, as exhibited in the frequency of these behaviors in Table 3.

Variations in COVID-related risk behaviours/practices by socio-demographic and behavioural factors rural-urban discrepancy in COVID-related risk behaviours

As indicated in Table 4, there were statistically significant differences in risk-behaviours by settlement, with participants residing at rural settlements (i.e. Kyegegwa and Adjumani settlements) scoring significantly higher on total, hygiene-, congestion-, nutritional & physical activity-related risk behaviours than peers in urban settlements (i.e. Kisenyi). As higher scores denote higher risk, refugees residing in rural settlements were more prone to COVID-related risk behaviours than peers in urban settlements. On the other hand, refugees residing in urban settings were more prone to international risk exposure than peers resident in rural settings.

Table 4: Associations between COVID-19 related Risk-Behaviours and Socio-demographic and behavioural factors.

Variables	Total risk index(24-120)	Hygiene risk index (9-45)	Congestion risk index (8-40)	International exposure risk index (3-15)	Nutrition & physical activity risk index(4-20)
	Mean(SD)	Mean(SD)	Mean(SD)	Mean (SD)	Mean (SD)
Refugee settlement					
Adjumani	49.80 (7.19) *	20.60 (4.03) *	11.8 (2.52)*	3.27 (0.64) *	11.76 (2.93) *
Kisenyi	46.78 (7.20)	18.19 (3.40)	11.77 (3.14)	3.74 (1.29)	11.33 (3.02)
Kyegegwa	57.37 (6.28)	22.81 (4.20)	13.29 (2.41)	3.38 (1.00)	14.42 (2.42)
Sex					
Male	51.81 (8.51)	20.74 (4.16)	12.99 (3.27)*	3.54 (1.16)*	11.98 (3.27)*
Female	51.35 (8.08)	20.56 (4.42)	12.04 (2.47)	3.42 (0.96)	12.82 (3.01)
Age group (in years)					
15-24	51.10 (8.50)*	20.66 (4.59)*	12.79 (2.92)*	3.40 (0.90)	11.89 (3.22)*
25-34	51.42 (8.46)	20.46 (4.53)	12.41 (2.86)	3.44 (0.98)	12.54 (3.01)
35-44	51.52 (7.99)	20.59 (3.92)	12.05 (2.58)	3.52 (1.14)	12.83 (3.06)
45-54	50.08 (7.29)	19.90 (4.07)	12.15 (3.08)	3.46 (0.96)	12.27 (2.98)
55-64	53.64 (7.69)	21.39 (4.06)	12.10 (2.26)	3.52 (1.24)	13.61 (3.21)
65-74	53.35 (8.36)	22.04 (4.33)	11.62 (2.04)	3.19 (0.69)	13.46 (3.36)
75 plus	56.25 (4.80)	24.13 (3.44)	11.88 (2.80)	3.63 (1.77)	14.25 (1.98)
Education level					
Primary	52.01 (8.12)*	20.72 (4.47)*	12.38 (2.82)*	3.39 (0.96)*	12.84 (3.03)*
Secondary	50.58 (8.36)	20.28 (3.82)	12.82 (3.13)	3.51 (1.14)	11.56 (3.17)
Tertiary/Vocational	50.96 (8.88)	20.58 (5.12)	13.17 (2.88)	3.67 (0.87)	11.50 (2.96)
No Education	51.99 (8.11)	20.92 (4.53)	11.88 (2.36)	3.42 (0.97)	13.18 (2.87)
Don't Know	50.33 (8.74)	19.33 (4.93)	12.00 (3.61)	3.00 (0.00)	13.67 (1.53)

Continued.

Variables	Total risk index(24-120)	Hygiene risk index (9-45)	Congestion risk index (8-40)	International exposure risk index (3-15)	Nutrition & physical activity risk index(4-20)
	Mean(SD)	Mean(SD)	Mean(SD)	Mean (SD)	Mean (SD)
Weekly income					
Less than 50,000	53.67 (7.86)*	21.44 (4.38)*	12.62 (2.70)*	3.38 (0.89)*	13.31 (2.94)*
50,000-100000	51.13 (7.00)	19.92 (3.45)	12.51 (2.45)	3.68 (1.32)	12.62 (2.91)
101,000-200,000	49.26 (9.09)	19.00 (3.31)	12.71 (3.94)	4.03 (1.90)	11.69 (3.04)
> 200,000	45.39 (7.72)	17.76 (4.28)	12.19 (2.02)	3.61 (1.12)	10.33 (3.76)
Religion					
Moslem	46.74 (7.33)*	18.16 (3.46)*	11.75 (3.03)*	3.70 (1.29)*	11.33 (3.07)*
Catholic	52.88 (7.90)	21.69 (4.20)	12.49 (2.25)	3.40 (0.82)	12.38 (3.41)
Protestant	53.71 (7.87)	21.87 (4.14)	12.55 (2.62)	3.29 (0.85)	13.22 (2.77)
Other	54.13 (7.03)	21.28 (3.86)	12.81 (3.07)	3.42 (0.96)	13.65 (2.75)
Frequency of exercise weekly					
Never	53.98 (7.89)*	21.32 (4.53)*	12.27 (2.49)	3.36 (0.95)	14.20 (2.52)*
Once	51.25 (7.37)	20.30 (3.71)	12.37 (3.04)	3.54 (1.17)	12.62 (2.42)
2-3 times	49.90 (7.88)	20.16 (4.21)	12.44 (2.76)	3.53 (1.06)	11.41 (2.61)
4 or more times	46.24 (7.86)	19.41 (4.24)	12.28 (3.39)	3.49 (1.02)	9.04 (3.51)

*Means statistically different at $p < 0.05$ at least.

Gender-Inequality in COVID-related risk behaviours

As indicated in Table 4, there were statistically significant differences in risk-behaviours by sex of participant, with male participants scoring on average significantly higher on congestion, international exposure, and nutritional & physical activity-related risk behaviours than female participants. Male refugees were thus more prone to COVID-related risk behaviours in these regards than female refugees.

Age disparities in COVID-related risk behaviours

As indicated in Table 4, there were statistically significant differences in risk-behaviours by age group. While refugees in age group above 54yrs exhibited a higher risk behaviour profile regarding total, hygiene, and nutrition & physical activity-related risk, colleagues in age group below 55yrs were more prone to congestion related risk behaviours.

Socio-economic variations in COVID-related risk behaviours

As indicated in Table 4, there were statistically significant differences in risk-behaviours by education and income. In general, university and tertiary level educated refugees were less prone to hygiene-, nutrition & physical activity related risk behaviours than less educated peers, but more prone to congestion, and international exposure-risk behaviours than less educated peers. Additionally, vulnerability to risk behaviours reduced with increasing income.

Variations in COVID-related risk behaviours by Religious affiliation

As indicated in Table 4, there were statistically significant differences in risk-behaviours by religious affiliation. As denoted by the higher scores, refugees of Catholics and Protestants religious affiliations were consistently more prone to total-, hygiene-, congestion-, and nutrition & physical activity related risk behaviours than Moslems. On the other hand, Moslems were more prone to international exposure risk than other religions.

Variations in COVID-related risk behaviours by physical activity

As indicated in Table 4, there were statistically significant differences in risk-behaviours by frequency of physical activity. Exposure to COVID-19 related risk behaviours reduced with increasing intensity of weekly exercise.

Relationships between COVID-19 risk behaviours

As shown in table 5, the various indicators of covid-19 risk behaviours were positively correlated with each other, i.e. Participants engaging in a given risk behaviour were also likely to engage in other risk behaviours.

Relationship between COVID-19 risk behaviours and COVID-19 symptoms

As shown in table 5, the various risk behaviours were positively correlated with COVID-19 symptoms, i.e. with increasing scores on COVID-19 risk behaviours, the number of COVID-19 symptoms increased. The correlation coefficient (r) ranged between 0.11-0.18.

Table 5: Correlation coefficients depicting association between sub-scales of COVID-19 risk behaviours and COVID-19 symptoms.

Variables	Total Risk index	Hygiene risk index	Congestion risk index	International exposure risk index	Nutrition and physical activity risk index
Hygiene risk index	0.83*				
Congestion risk index	0.64*	0.36*			
International exposure risk index	0.16*	0.03	0.21*		
Nutrition & physical activity risk index	0.60*	0.25*	0.10*	0.11*	
No. of symptoms associated with COVID-19	0.17*	0.18*	0.11*	0.04	0.05

*Correlations significant at $p < 0.05$ at least

Table 6: Multiple linear regression models demonstrating predictors of COVID-related risk behaviours among refugees in Uganda.

	Total risk index standardized beta	Hygiene risk index standardized beta	Congestion risk index standardized beta	International exposure risk index standardized beta	Nutrition & physical activity risk index standardized beta
Refugee Settlement					
Adjumani	0.06	0.10	-0.07	-0.40*	0.14
Kyegegwa Kisenyi (contrast)	0.39*	0.32*	0.15	0.35*	0.29*
Sex					
Male	NA	NA	0.10*	-0.04	-0.01
Female (contrast)					
Age group	-0.04	-0.02	-0.11*	NA	0.02
Education level	-0.04	0.01	0.13*	0.04	-0.05
Weekly income	-0.11*	-0.05	-0.06*	0.02	-0.13*
Religion					
Catholic	0.10	0.13	0.08	0.17*	-0.05
Protestant	0.16*	0.19*	0.12	0.18	0.01
Other, Moslem (contrast)	0.05	0.04	0.07	0.16*	0.01
Frequency of exercise weekly	-0.18*	-0.06	NA	NA	-0.46*
COVID-19 symptoms	0.10*	0.11*	0.10*	0.08*	-0.02
Model fit/diagnostics					
F-value	54.2*	27.5*	14.9*	6.1*	64.1*
Adjusted R-Square	40.35	0.21	0.12	0.04	0.41
VIF range	1-10	1-10	1-10	1-10	1-10

Note: *Significant at $p < 0.05$ at least; NA=Not Applicable. Only variables that were statistically significant at $p < 0.1$ in the Bivariate tests were included in the multivariable analyses.

Predictors of COVID-19 risk behaviours demographic and socio-economic predictors of COVID-19 risk behaviours

As exhibited by the standardized betas and their p-values in table 6, socio-demographic, socio-economic, behavioral and clinical variables, remained significant predictors of the various risk behaviours, even when possible confounding with other potential predictors was adjusted

for in the model. Specifically, refugees in rural settlements, of male sex, young age and low socio-economic status (i.e. measured in terms of low-income bracket and poor education) remained at heightened risk of exposure to COVID-19 risk behaviors. In addition, refugees of Moslems affiliation were generally at lower exposure to COVID-19 risk behaviors than other religions (Table 4).

Physical activity as predictors of COVID-19 risk behaviours

The frequency of exercising significantly predicted overall- and nutritional & physical activity related risk for COVID-19, i.e. with increasing frequency of exercise, these COVID-19 protective activities increased on average. These results were consistent even when plausible confounding with other potential predictors was controlled for in the model (Table 6).

COVID-19 symptoms COVID-19 risk behaviours

The positive correlation between risk behaviours and COVID-19 symptoms was maintained even after control for plausible confounding. The number of COVID-19 symptoms increased in general as exposure to COVID-19 risk behaviours increased (Table 6).

DISCUSSION

Public health approaches that incorporate the assessment of the nature, extent and predictors of diseases and health risk behaviors have previously been acknowledged in the literature as first steps in epidemic control.²⁴ Additionally, unpacking and addressing social and demographic inequalities in emerging diseases at an early stage is cost-effective as resources can be targeted where they are most needed in timely manner.²⁵ Accordingly, we investigated the nature, extent and predictors of COVID-19 risk behaviors among refugees in Uganda, with the intent to identify risk groups among conflict refugees and inform interventions tailored to their specific need.

Findings and plausible explanations

The majority of refugees adhered to good practice of washing hands with water and soap, avoided congestion or congregational settings and the use of communal transport services e.g. passenger motorbikes (commonly known as Boda Boda), buses, taxis and trucks. However, critical areas of concern affecting 25-70% of refugees included poor use of sanitizers and disinfectants; poor adherence to social distancing, handshaking, sneezing/coughing improperly, rare use of mask; and poor practice of immune boosting activities such as exercise and poor nutritional habits. Though comparable research from humanitarian settings is to the best of our knowledge lacking, data from non-humanitarian populations suggests that difficult living conditions, personal abilities, fear of or distrust in authorities and deviations in COVID-19 related messaging over time may impact negatively on individual compliance to behavioral change interventions.²⁷⁻²⁹ Our findings could be a reflection of such circumstances, given these conditions are prominent in humanitarian settings.¹³⁻¹⁶ Moreover, poor adherence to immune boosting activities (e.g. s physical exercise) could stem from the underlying pre-existing mental and psychosocial challenges observed among post conflict refugees, known to negatively impact

on uptake of behavioural interventions in humanitarian settings.^{11,12,17,18}

We observed significant correlations between the various categories of COVID-19 risks behaviors (i.e. congestion, hygiene, international exposure and nutrition/physical activity risk behaviors) suggesting that refugees indulge in multiple risk behaviors concurrently. This coupled by the findings demonstrating a plausible pathway linking COVID-19 risk behaviors to development of COVID-19 symptoms, should be early warning for a ferocious spread of COVID-19 in refugee settings if current interventions remain unaltered.

Consistent with recent data emerging from non-humanitarian settings, we found some demographic inequalities in COVID-19 risk behaviours, adding to the literature showing that women are more averse to risk-taking behaviours than men.²⁸⁻³² Scholars within social and health sciences have partly attributed the lower propensity among women for risk-taking behaviour to their greater expectations of negative outcomes.³³ In the context of this study therefore, it is highly plausible that risk-behaviours may have been perceived to result in transmission of COVID-19 to a higher degree among women than among men and therefore the higher compliance to behavioural change interventions set forth among the women.

Age

Significantly predicted congestion related risk behaviours, i.e. with increasing age, congestion related risk behaviours reduced among refugees. The high unemployment rate observed among young refugees has promoted idleness, and engagement in non-productive activities such as gambling, and health risk behaviours including substance abuse.^{34,35} These activities are often concentrated in city centres and congregational settings with an increased risk for COVID-19 spread.

Religious affiliation predicted COVID-19 risk behaviours

Refugees of Protestants, Catholics and Others religious affiliations generally exhibited higher risk of exposure to COVID-19 risk behaviours than Moslems. A highly plausible explanation could be that habitual practices typical in the Islamic population (e.g. veiling among women, routine hand-washing and other hygienic practices undertaken before and after prayers) are congruent with practices known to protective against health hazards including COVID-19.

Socio-economic inequalities in COVID-related risk behaviours

Our findings regarding the association between socio-economic status and exposure to COVID-19 risk behaviours are contradictory. Consistent with theories in support of a socio-economic gradient in response to

behavioural change interventions, where it is purported that socio-economically advantaged individual (e.g. educated and higher income individuals) are more likely to accept and respond to health interventions, we found high income to be associated with reduced exposure to COVID-19 risk behaviours.³⁶ In stark contrast, we found high education to be associated with increased exposure to COVID-19 risk behaviours. Discrepancies in findings could be a reflection of flaws/gaps in theories in the field or flaws in measurement (discussed further below).³⁷ In the former case, further investigation of this issue using other methods (e.g. qualitative studies) is motivated.

We found regional variations (i.e. urban vs. rural settings) in COVID-19 risk behaviors. Refugees in rural settlements exhibited on average higher exposure to risk behaviour than peers in urban settlement. Several factors could account for these differences. First, the homogenous cultural composition of refugees in each of the studied settlements (i.e. predominance of Somalis in the urban settlement vs. South Sudanese and Congolese in the rural settlement) suggests that behaviors and practices in general could be alike within each settlement but different across settlements. Numerous studies have supported the notion that health communication and the way it is perceived is sensitive to cultural variation.^{37,38} Secondly, the role of social networking and support in behavioral change cannot be ruled out.³⁹ In contrast with rural peers, urban refugees lived in integrated rather than separate settlements with the host communities, and this may have provided opportunities for information access, sharing and social networking of benefit to COVID-19 risk management.

Methodological Issues

The challenges in execution of this study warrant some acknowledgement. First, this was a rapid assessment of the nature, extent and predictors of COVID-19 risk behaviours. As such a cross-sectional study design was most appropriate. Caution should nonetheless be exercised in assuming causal links between the dependent and independent variables. We can only firmly establish associations.

Secondly, being a new disease, the measures used to represent the key concept of this study i.e. COVID-19 risk behaviours, are previously un-validated. Though we have tested the measures for reliability and found them to be sufficient, an elaborate assessment of other aspects of measurement validity e.g. content validity are warranted on its own right as new information on the disease continues to emerge.

The study gathered data from refugee households through interviews under difficult circumstances of a lock-down in the country. It is not clear how this could have impacted on their responses. We attempted to reduce the potential impact of such uncertainties on validity and reliability of findings through ensuring proper informed consent processes, adherence to ethical standards in humanitarian

research and adaptation of Standard Operational Procedures in light of COVID-19 to reduce fears of transmission risk among participants. In addition, we adapted strategic partnerships with Organisations serving the refugees (i.e. Agency for Cooperation and Research in Development (ACORD) and Lutheran World Federation (LWF) and government through Ministry of Health (MoH), in a bid to reinforce trust and promote legitimacy of the study among the participants.

CONCLUSION

COVID-19 risk behaviors among conflict refugees in Uganda are multifaceted in nature, widespread in extent and associated with COVID-19 symptom development, signaling for high risk of transmission in humanitarian settings. Moreover, there are underlying demographic, socio-economic and behavioral inequalities in COVID-19 risk behaviors, warranting the tailoring of interventions to meet the needs of the most vulnerable clusters in the refugee community.

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