Islamic Republic of Afghanistan

Ministry of Public Health

Monitoring & Evaluation and Health Information System General Directorate

Prevalence of COVID-19 and its Related Deaths in Afghanistan: A Nationwide, Population-Based Seroepidemiological Study

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World Health Organization

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List of abbreviations:

ANC	Antenatal Care
CDC	Centers for Disease Control and Prevention
CI	Confidence Interval
DHIS2	District Health Information-2
EA	Enumeration Area
ELISA	Enzyme linked Immuno Sorbent Assay
FDA	Food and Drug Administration
GCMU	Grant Contract Management Unit
ICU	Emergency Center Unit
IRB	Institutional Review Board
NGO	Non-governmental Organization
NSIA	National Statistics and Information Authority
PMO	Performance Management Office
PPHD	Provincial Public Health Directorates
PNC	Postnatal Care
RDT	Rapid Diagnostic Test
STATA	South Texas Art Therapy Association
USAID	United States Agency for International Development
WHO	World Health Organization

Acknowledgment:

The National Survey of Prevalence of COVID-19 and its Related Deaths in Afghanistan have been led by Monitoring & Evaluation and Health Information System General Directorate in the country. The main objective of the survey was understanding the COVID-19 infection and death rate in the country. Hereby, I would like to convey my sincere gratitude from enthusiastic efforts of survey principle investigator and co-investigators for their dedication in implementing this survey. Moreover, it is worthy to appreciate from all survey regional Master Trainers, National Statistic and Information Authority (NSIA) team, World Health Organization (WHO) team, USAID, World Bank, CDC US, Performance Management Office (PMO), GCMU, ANPHI, all Provincial Public Health Directorates (PPHDs), Health promotion Department (HPD), all BPHS and EPHS Implementing NGOs, survey steering committee team, Data management teams for their efforts during the survey. Apparently with no doubt the efforts undertaken by all the mentioned teams have made implementation of this survey successful within the given tight deadline.

Additionally, I would also like to express my appreciation to all the participants of the survey for their consent to participate.

Sincerely

Dr. Ahmad Jawad Osmani

Acting Minister - Ministry of Public Health

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Background:

The COVID-19 disease has been spreading to 213 countries since start of epidemic in China (Wuhan). As of 10th August 2020, over 20 million (20,104,418) positive cases have been detected in all over the world, with more than 7 hundred thousand (735,305) deaths[i]. Afghanistan has reported the first case of COVID-19 in Herat province on 24th Feb 2020 who had travel history to Iran. As of 10th August 2020, Afghanistan has reported 37,162 positive cases and with 1,328 deaths[ii].

So far, no vaccine has been introduced and there is no effective and specific treatment for COVID-19; hence, the countries have recommended non-pharmaceutical measures such as social distancing, home quarantine, closure of schools and universities, and avoiding gathering in order to decrease the virus transmission within the society and decrease the burden on healthcare system. Afghanistan has undertaken the preventive and non-pharmaceutical measures as soon as the first case of COVID-19 was detected in Herat province.

Case detection and isolation of patients play a key role in prevention of communicable disease spread as well as COVID-19 patients. So far, the initial focus of the Ministry of Public Health (MoPH) was on patients with severe disease in order to decrease mortality due to COVID-19 and; as such; the full spectrum of the disease, including the extent and fraction of mild or asymptomatic infections that do not require medical attention are not clear.

Thus, based on the instruction of H.E the president of Afghanistan, the Ministry of Public Health has conducted a national survey on estimation of COVID-19 cases and its' associated deaths in 9 regions of the country. The study steering committee was established in prior with participation of representatives from National Statistic and Information Authority (NSIA), Central Public Health Laboratories (CPHL) and World Health Organization (WHO) and study protocol was reviewed, given feedback and approved by Institutional Review Board, John Hopkins University, WHO, CDC, it's and added among the WHO global unity study.

Objectives:

The primary objectives for this seroepidemiological investigation are as below:

- To determine the magnitude of COVID-19 infection in the general population and age-specific cumulative incidence, as determined by seropositivity and clinical symptoms of COVID-19
- To determine the magnitude of asymptomatic or subclinical infections

- To determine the deaths rates in different time periods (since March 2019) and COVID-19 deaths in population
- To identify the leading cause of deaths since March 2020 in Afghanistan

Methodology:

The national seroepidemiological investigation for COVID-19 infection is a population-based, cross-sectional study. Participants are asked questions regarding demographic information, signs and symptoms of COVID-19 disease, existing co-morbidities, and deaths in the family and their cause of death in the past 15 months. In addition the blood serum is collected from participants for RDT and ELISA tests. It is worth mentioning that for people who are tested IgM positive during the survey, the survey team have provided home isolation advices to them.

Sampling Strategy and Sample Size of the Study

The seroepidemiological study sample have provided estimates for the whole country, for urban and rural areas, and for the nine regions. As a national study, it is done in 8 regions of Afghanistan as well as Kabul province, considered as a separate region making it nine. In this study two stage cluster sampling is used. In the initial stage, the updated list of Enumerated Areas (EAs) is used as the study frame, 31- 44 clusters (EAs) are selected randomly per region by direct support of National Statistical and Information Authority (NSIA); therefore, total clusters for this study was 360 EAs.

In the second stage, all households in an enumeration area was listed and 16 households per EA are selected using random sampling table provided by NSIA. In addition, NSIA provided the maps for all selected EAs with exact boundaries. Age stratification is done in the study; there was two individuals for RDTs were randomly selected in each household; one from 5-17 years of age and one equal/above 18 years of age. Due to shortage of time and to have valid data, insecure and inaccessible EAs are not included in the study.

Sample Collection for RDT and ELISA:

COVID-19 IgG/IgM Rapid Test Cassette

Blood samples are collected from two household member randomly (one from 5 to 17 years and another from equal and above 18 years of age) and are tested using RDTs with results available within 15 to 20 minutes. The RDTs used in this survey are FDA authorized with related IgM sensitivity of 95.7%, relative IgM specificity of 97.3%, and relative IgG sensitivity of 91.8% and relative IgG specificity of 96.4%.

The blood sample collection for RDTs were two drops of blood by finger prick. As the RDTs were done in front of the participant, the result of RDT was shared with participants during the study.

Data Collection, Management and Analysis

Each participant recruited into the investigation are asked to complete a questionnaire which covered demographic information of household members as well as exposure history, deaths, and cause of death information in past 15 months starting from March 2019. Before the data collection, master trainers were designated for each regions and provided 2 days training by teams from MoPH, NSIA and CPHL. The data collection teams of each province were introduced by each provinces' related NGOs and Provincial Public Health Directorates (PPHDs) and trained by master trainers for two days.

It is worth mentioning that initially 5 days were planned to collect the data; however, due to security challenges, negotiation with anti-government groups to grant permission for conducting the survey and geographical distance in some provinces, the data collection took 2 weeks to be completed. The total number of data collection team were 191 teams with participation of two members (one male and one female) and since there was need for drawing blood from participants for RDT and ELISA tests, team members consisted of nurses/midwives or lab technicians. The regional data were entered into DHIS2 system after collection and quality check was applied on them by other teams. Afterwards the data was transferred into STATA for data analysis.

In this survey weighted analysis have been applied to adjust for complex survey design. Sampling weight, non-response weight and post stratification weighting was done using STATA software. The proportion were calculated and 95% confidence interval and p-value were adjusted for the survey design.

In order to present the data for current and past infection of COVID-19, the people who have been tested positive for both IgG and IgM and either IgM or IgG was summed while for current infection to COVID-19 in the survey, only IgM positivity proportion is reported.

Quality Assurance from Implementation of the Survey

In order to assure the quality of data collection, the data collection teams were monitoring during their data collection by related master trainers in regions' capitals as well as, by surveillance staff in provinces. Before entering the data into the system, the questionnaires were quality checked and some participants whose phone numbers were available in the questionnaire, were contacted through phone calls randomly. In addition, for verification of

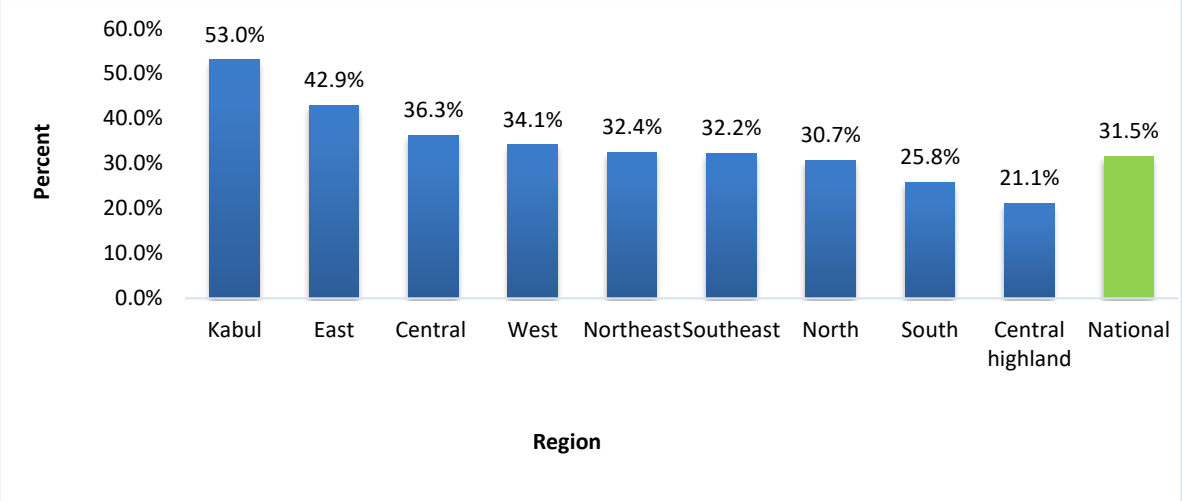
RDTs used in the survey, ELISA test will be applied on half of sample size in 9 provinces. It is worth mentioning that ELISA tests haven't been performed yet so there might be slight changes in data results after adjusting the test results with ELISA.

Results:

Of the 360 clusters planned for this survey, 338 (94%) completed the survey. Similarly, of the total planned 5760 households, 5177 (90%) households completed the survey. A total of 9,514 household members in this 338 clusters were interviewed and tested for COVID-19 in this survey. Of the total respondents, 53.9% were males and 46.1% females. More than three-fourth (79.2%) of the respondents were from rural areas and 27% in urban areas. The mean age of the respondents was 27 years with majority being married (79.2%).

The total proportion of COVID-19 positive infection (including all positive results, IgG positive (past infection) IgM positive (current infection) or both IgG and IgM positive) was 31.5% for Afghanistan. Kabul Region had the highest proportion of COVID-19 positive infection (53%) followed by East Region (42.9%), Central Region (36.3%), West Region (34.1%), Northeast Region (32.4%), Southeast Region (32.2%), North Region (30.7%) and lowest was in Central-Highland Region (21.1%) followed by South Region (25.8%) (**Figure 1).**

Figure 1. Proportion of COVID-19 positive infection (including all positive results, IgG positive, IgM positive or both IgG and IgM positive) among all study age groups (both adults and children)



Rapid Diagnostic Test (RDT) Results

RDT results for 18 years or above

A total of 5,168 household members of 18 or above were interviewed and tested for the survey. According to the findings of the survey, the proportion of COVID-19 positive infection among respondent of 18 years or above was 35.2% and the proportion of COVID-19 negative infection was 64.8% (**Table 1)**. The proportion of COVID-19 positive was 33.9% among males and 37.1% among females. Likewise, the proportion of COVID-19 positive was 42.3% in urban areas compared to 31.6% in rural areas **(Table 2)**.

Table 1. Proportion of COVID-19 positive (including all positive results, IgG positive, IgM positive or both IgG and IgM positive) by RDT among 18 years or above.

Region	% [Confidence Interval (CI)]	P-Value
Central region	45.5 [37.8-53.4]	0.0001
Central highland region	24.9 [17.9-33.7]	
East region	49.1 [41.5-56.8]	
Kabul region	56.8 [52-62]	
Northern region	35.3 [28.1-43.4]	
Northeastern region	39.3 [31.9-47.4]	
Southern region	26.6 [19-36]	
Southeastern region	40.9 [34.4-47.9]	
Western region	39.8 [34.8-45.1]	
National	35.1 [31-39.5]	

Table 2. Proportion of COVID-19 positive by RDT among 18 years or above by area and gender

Areas	% [Confidence Interval (CI)]	P-Value
Rural Areas	31.7 [26.5-37.4]	0.01
Urban Areas	42.3 [35.7-49.2]	
Gender		
Males	33.9 [29 -39.2]	
Females	37.2 [32-42.6]	

Moreover, the survey findings reveal that 2.6% of participants 18 years old or above were IgM positive (current infection). Southeast region had the highest proportion of IgM positive (7%), followed by Central region (4.3%), Northeast region (4%), Western region (3.4%), Kabul region (2.7%), Eastern region (2.5%), Southern region 1.6% and Northern region (1.4%) and it was lowest in the Central highland region (0.9%) (Table 3).

Table 3. Proportion of IgM positive RDT results by region among 18 years or above

Region	% [Confidence Interval (CI)]	P-Value
Central region	4.3 [2.4-7.6]	0.0001
Central highland region	1 [0.4-2.3]	
Eastern region	2.5 [1.4-4.5]	
Kabul region	2.7 [1.4-5]	
Northern region	1.4 [0.6-3.4]	
Northeastern region	4 [2.1-7.8]	
Southern region	1.6 [0.7-3.4]	
Southeastern region	7 [3.7-12.9]	
Western region	3.4 [1.8-6.3]	
National	2.6 [2-3.5]	

RDT results for 5 to 17 years

A total of 4,346 household members aged 5-17 years were interviewed and tested in this survey. Of the total tested, the proportion COVID-19positive (including all positive results, IgG positive, IgM positive or both IgG and IgM positive) among 5-17 years old was 25.3%, which was 30.7% in urban areas compared to 23.4% in rural areas. The proportion of COVID-19 positive among this age group was 24.1% among males and 26.7% among females. More than a quarter (29.2%) of the COVID-19 positive infection was reported among 15-17 years old. Kabul region had the highest proportion (46.4%) of COVID-19 positive among participants aged 5-17 years. It was followed by East region (32.4%), West region (24.5%), South region (24.4%), North region (23%), Central region (21%), Southeast region (17.6%) and the proportion of IgG and IgM positive was the lowest in the Central highland region (14.6%) (**Table 4**).

Table 4. Proportion of COVID-19 positive infection by RDT results by region among 5-17 years

Region	% [Confidence Interval (CI)]	P-value
Central region	21 [14.5-29.3]	0.04
Central highland region	14.6 [8.6-23.8]	
Eastern region	32.4 [26.8-38.6]	
Kabul region	46.4 [40.8-521.]	
Northern region	23 [16.8-30.8]	
Northeastern region	20.9 [15.1-28.2]	
Southern region	24.4 [14.5-38]	
Southeastern region	17.6 [10.6-27.6]	
Western region	24.5 [18.4-31.8]	
National	25.3 [20.5-30.8]	

Table 5. Proportion of COVID-19 positive infection by RDT results by area and gender among 5-17 years

Areas	%	[Confidence Interval (CI)]
Rural Areas	23.4	[17.5-30.6]
Urban Areas	30.8	[24.8-37.5]
Gender		
Males	24.2	[18.5-31]
Females	27.8	[21.3-33]

The survey findings also reveal that the proportion of IgM positive among participants aged 5-17 was 3.3% (4.1% males and 2.3% females). The highest proportion of IgM positive was reported in the south region (4.7%), followed by Kabul region (3.5%), West region (3.3%), Central region and Northeast region (both 2.8%), Southeast region (2.4%), Central highland region (1.6%), East region (1.4%) and lowest the North region (1.2%). Furthermore, the proportion of IgM positive was 3.7% in rural areas compared to 2.3% in urban areas during the survey.

Table 6. Proportion of COVID-19 IgM positive RDT results by region among 5-17 years

Region	% [Confidence Interval (CI)]	P-value
Central region	2.8 [1.2-6.3]	0.01
Central highland region	1.6 [0.4-6.6]	
Eastern region	1.4 [0.7-3.1]	
Kabul region	3.5 [1.6-7.3]	
Northern region	1.2 [0.4-3.7]	
Northeastern region	2.8 [1-7.6]	
Southern region	4.7 [1.6-13.1]	
Southeastern region	2.4 [0.8-6.8]	
Western region	3.2 [1.7-6]	
National	3.3[1.8-6.3]	

Discussion

The national COVID 19 morbidity and mortality survey in Afghanistan reveals that about 10 million people (31.5%) had either current or past COVID-19 infection, while about 6 million adults aged 18 or above and 3 million children aged 5 to 17 years old had either current or past infection .

The finding of the current survey is consistent with the telephone survey conducted with the randomly selected samples of 713 health volunteers to estimate the COVID-19 morbidity in the country. According to the telephone survey, the estimated proportion of the individual with COVID-19 signs and symptoms was at 49.6%; it is close to the current and past infections in the most of the regions reported in the current survey.

Furthermore, the CoMo model, developed by the University of Oxford in collaboration with the World Health Organization and 65 member states, estimated the peak incidence of COVID-19 in four distinct scenarios: good, bad, very bad, and appropriate. In this model, if the preventive interventions (in a very bad scenario) are not considered, the peak of COVID-19 was predicted in June 2020, and the COVID-19 infection will infect an estimated 69.6% of the population with 20,509 death by end 2020.

Table 1: COVID 19 morbidity and mortality data by various source in Afghanistan

Source	% of COVID 19 Morbidity	Number of COVID 19 Mortality
National COVID 19 Morbidity and Mortality Survey	31.5% (10 of entire population)	
CoMo Model	69.6%	20,509
Telephone Survey	49.6%	NA

Local Governance Organization Assessment	NA	9,667
Youth Network	725,157 Persons	2,883 in each province
National Surveillance Data	36,605Persons (12 July 2020)	1038 (12 July 2020)

In communicable disease, one of the main indicators in decision making is estimating the herd immunity among the population. Herd immunity occurs when a higher proportion of the population is immunized from an infectious disease, hence, reducing the probability of the disease transmission from one person to another and the entire population protected from that disease.

Herd immunity can be achieved either through infecting individuals or vaccinating people. The levels of herd immunity vary for different diseases, for instance, it is estimated 94% for measles, which indicates that to build up the herd immunity against measles, 94% of the population must be immunized for the measles. Determining the country's herd immunity is directly related to the estimation of Basic Reproduction Number (Ro) of the disease, which indicates that on average how many person can be infected by one infected person.

Different studies report different herd immunity level based on the COVID-19 R0 of different contexts. The findings for herd immunity ranged from 43% to 85%. A study conducted by Randolph and Barreiro indicates that if we consider R0=3 (that is, one person can infect up to 3 others); the required herd immunity is 67 % at the population level[iii].

The study conducted by the Genton and Jeong reveals that the majority of the country's population have not been infected enough to achieve the herd immunity, and these findings are confirmed by the report of the lowest COVID-19 morbidity levels from the most countries, for example Sweden reported an infection rate of 7% by the end of April despite no lockdown; the mentioned study also states that obtaining the herd immunity by exposing the population to the disease causes the simultaneous infection of the majority of the population and pave the way for the second wave of the disease[iv]. According to the John Hopkins University, to build up the herd immunity against COVID 19, 70% of the population should be immunized[v]. While the study conducted by Kwok and his team estimated herd immunity based on different Ro, in case of Ro= 1-2, the estimated herd immunity is 50%, for Ro=2-4 (herd immunity= 56.1 to 74.8 %), and for R0> 4 the estimated herd immunity are between 77.9 to 85%[vi].

Considering that more young and active people in the community are exposed and infected, the recent study estimated the required herd immunity in the community higher than 43%[vii]. Also Britton and his team estimated herd immunity against COVID-19 between 43% - 60%[viii]. In

addition, a study published in the Lancet Magazine, considered Ro = 2.2 in Wuhan, China, an estimated of 60% of the population needs to be immunized to reach the herd immunity[ix], and another study shows that with Ro =2.5 – 3, the required herd immunity expected to be 60-70%[x].

Apart from all the studies on herd immunity, on the study conducted by Seow and his team on antibody decay over time found that the amount of antibodies produced in the body after contracting the disease will be reduced during 94 days[xi].

Given the results of all the above studies and the existing survey which shows the current and past COVID-19 infection rate is about 10 million people (31.5%), it can be summarized that 32% of population were infected with the COVID-19 which does not indicate a herd immunity for the entire country, and most of the population are still at the risk of infection.

As per the findings of this survey, there are differences between provinces and regions; some provinces have crossed the peak. For instance, in Kabul province, more than half of the province's population has achieved the required herd immunity, the lowest reported herd immunity of 43%, while this proportion is 21 percent in the central highland. As majority of the populations are still at risk of infection. The preventive measures should be lifted gradually step by step according to WHO guideline.

Based on the information of countries with a similar context to Afghanistan, if we assume the Ro = 2 to 3 in the country , the required proportion of COVID-19 infection which is required to build a herd community is between 56 to 75%; Kabul province with 53% COVID 19 morbidity is in this range. The eastern and central regions with 34 to 42% COVID 19 adult morbidity are relatively in good position, but the western, northeastern, southeastern, northern, southern and central highlands regions with less than 35% of morbidity are not in relatively good condition and not close to the herd immunity.

Regions	**Current and Past COVID-19 Infection**	**Minimum % for herd immunity is reported 43 % and Maximum is reported 85%**	**Number of people at risk of infection based on average of all reported herd**
Kabul	53%	Based on herd immunity of 43%, Kabul already achieved it. But if we consider the higher levels , it has not	352090

Northeast	32.4%	Not reached to minimum level of herd immunity	1164297
North	30.7%	Not reached to minimum level of herd immunity	1227256
West	34.1%	Not reached to minimum level of herd immunity	1020314
Central highland	21.1%	Not reached to minimum level of herd immunity	386875
Central	36.3%	Not reached to minimum level of herd immunity	579968
East	42.9%	Not reached to minimum level of herd immunity	479674
South	25.8%	Not reached to minimum level of herd immunity	925019
Southeast	32.2%	Not reached to minimum level of herd immunity	925019
National	31.5%	Not reached to minimum level of herd immunity	8462611

In reference to above discussion and evidence, generally the preventive and control measures in the society should not be lifted at once because only 31.5% of the population have had current or past infection and the majority of the population have not achieved the necessary level of immunity against the disease. If disease control policies continue, the health system can control the level of morbidity of disease. Otherwise, the rate of hospitalization and the need for ventilator for patients will be increased and subsequently the health system should bear its high burden.

Conclusions

- The proportion of COVID-19 positive infection is higher in urban areas compared to rural areas. It means that the COVID-19 spread will be towards rural areas in the coming months, therefore, there is need to improve health care facilities and services in these areas.
- While there is no difference in the proportion of COVID-19 positive infection by sex, the infection rate is higher among adults age group than children.
- The COVID-19 morbidity were reported higher in Kabul, East, and central regions.

- The rate of infection in Afghanistan has not yet reached the level of herd immunity, which indicates that there are still suspected population in the country that needs for considering precautionary measures and not lifting them so early.

Recommendations

The recommendations in this report are based on the international evidence and current context of Afghanistan, and these recommendations are not based on the findings of this survey.

Public awareness and risk communication: Mobilization of the national health system capacities for public awareness (3,386 public and private health facilities, 40,000 civil servants, 60,000 community health workers and private sector staff); utilize citizen charter network, Health Shura, school teachers and students, Mullahs; and use of media (Radio & TV).

Health messages: Mandatory use of mask within the workplaces, educational institutions, shops and other commercial and public areas; enhance immunity level of the population (level of vitamin D is lower among females) such as use of vitamin D fortified oil increase utilization of primary health care services (vaccination, ANC, PNC and etc..) for routine health services disrupted due to COVID-19.

Active surveillance and contact tracing: Strengthening contact tracing and to utilized the support of all related sectors including private health sector on case detection, sample collection and referral of the cases; use of school for contact tracing (performance based payment); electronic data collection on COVID-19 case findings into Flexi Feedback; enhance the lab capacity (establish COVID-19 diagnostic labs at the regions and provinces, capacity building of diagnostic labs for public and private labs at the provincial levels, and providing the required equipment and supply for the diagnostic labs)

Improvement of health care service coverage for COVID-19 patients from village to national level: Home base care (for mild and moderate cases) by the mobile health teams and public and private clinics; Hospital based care (for severe and critical cases); to prepare of national, regional, provincial hospitals and CHCs and private hospitals for severe and critical cases; to strengthen the Intensive Care Units (ICUs) for critical cases; capacity building of health care workers (advanced skills); and continuation of other health care packages particularly maternal and child care.

Preparedness for the winters season: Identify vulnerable areas where the roads and transportation system are blocked during the winter; provision of oxygen machines and

ventilators (at district level) and establishment of oxygen production factory (at provincial level); provision of medicine and primary health care services (Sehatmandi project) for COVID-19; provision of strategic and essential medicine for primary health services and COVID-19 patients (the health centers run by MOPH); encouraging and implementing preventive measures at the national and local levels.

Change in the lockdown/movement restriction measures: Relaxing the lockdown/movement restrictions measures based on WHO recommendations; gradual opening of schools and educational institutions (for instances, only secondary and high school or two to three days per week; availability of active surveillance; availability and implementation of case detection guideline in the schools; clear guideline for contact tracing); resuming restaurants and wedding halls activities based on MOPH guidelines (for instance maximum participants should not be exceed more than 200 guests and keeping social distance of 2 meter between the tables); gradual resumption of other construction and developmental projects.

Study limitations

1. Time limitation (tight deadline) for the survey implementation
2. Insecurity in certain areas of the survey
3. Inability to use proper household listing and maps of Enumeration Area in the areas where government lack control over which might have affected the findings
4. To assess the accuracy of the rapid tests, the ELISA tests has not not performed yet, so final result in this report was not adjusted accordingly which will be adjusted once ELISA is conducted.

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