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Impact of the Armed Conflict of 2015-2016 in Aden on Health Services and the Availability of Medicines

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Abstract

To assess the impact of the armed conflict of 2015-2016 on the availability of medicines and health service in Aden Governorate whilst the rebels over-run the city. A cross sectional survey was done during the period, September-November 2016. The survey included 63 medicinal preparations as marker medicines in 142 public health facilities including private pharmacies. Direct questions and a retrospective study of the United Nations and other organizations that were working in area reporting were studied. I.V. fluids had the highest availability in the market whilst vaccines had the lowest average availability at 60%. Medicine prices were increased by 71%. The function of health facilities was almost on the verge of collapse. The four districts containing the main hospital and the medical stores were inaccessible and completely controlled by the rebels. Two out of six hospitals remain functional. Dengue and malaria rampantly spread and approximately 65,250 civilians were affected. The situation was further aggravated by the absence of basic services such as electricity, water and food.

Keywords

Armed Conflict, Aden, Yemen, Affordability, Availability, Lifesaving Medicines

1. Introduction

Aden is situated on a peninsula at the Gulf of Aden in the south-west of Yemen. It is a strategic port linking the Mediterranean Sea and the Indian Ocean. It was a British colony from 1839 until 1967. Following the independence in 1967, Aden became the capital of the Democratic Republic of Yemen. In 1990, the Democratic Republic of Yemen united with the Yemen Arab Republic in the north to form the present Yemen Republic, with Sanaa as the capital city and

Aden a governorate.

Since independence in 1967, Aden acted as the fighting arena for the various political factions trying to settle their differences. In our lifetime, Aden witnessed four armed conflicts [1]:

1) From 1963 to 1967 was the independence struggle with the British army who were then considered an occupying force.
2) In 1977 was the independence civil war between two rebel groups fighting for dominance over the city.
3) In 1986 there was the armed conflict between two factions of the same ruling party that won the war in 1977.
4) In 1994 was the armed conflict that became known as the Unity War between the central government in Sanaa and rebel forces from the southern part of Yemen who declared termination of the unity agreement between South and North Yemen.

In all those armed conflicts there were civilian as well as military personnel, but there was minimal disruption of infrastructure of the country including health services. In 2015 a group of rebels over-ran the capital Sanaa, the president and the prime minister were put under house arrest. An armed conflict spread all over Yemen between the rebels and the army supporting the government, but Aden suffered most. On the 25th March 2015, the city was taken over by the armed forces against unorganised civilians who called themselves "The Resistance". Teresa Sancristóval [2] (head of the emergencies for medical charity organization in Yemen) described the situation as *"..., I felt that the conflict in Yemen is much of a war against civilians than a war against armed groups."*

The armed militia obliterated the Aden Governorate between March and July 2015 and took over control. Free movement was restricted in the following counties: Crater, Maalla, Tawahi and Khormaksar. In February 2016 the violence had forced people to flee; it appeared overnight that almost half of the population including women and children were displaced internally and to other countries [3].

With the impact of the crisis unfolding, there were detrimental effects economically and socially. There were devastating effects on basic health infrastructure and services with a shortage of essential lifesaving medicines, as well as a severe fuel crisis resulting in a loss of basic services.

The objectives of this study are to:

1) Assess the impact of the conflict on health services including the availability of medicines.
2) Evaluate the consequences of the armed conflict on the health status of the population in the governorate of Aden.

2. Obj 1: Medication Availability

2.1. Method & Materials

To assess the availability of medicines in the Aden governorate, a cross-sectional survey for medicine outlets in all eight districts was included (see Table 1). 36

Table 1. Shows the number of health facilities and pharmacies sample size included in the survey.

District	Hospitals	Poly clinic	Pharmacies	20% Pharmacy
				Sample size
Buraikah	0	2	34	7
Darsaad	0	1	41	8
Khor maksar	1	1	122	24
Malla	0	1	33	7
Mansoorah	2	3	185	37
Seerah	2	2	60	12
Sh. Othman	1	2	113	23
Tawahi	0	1	28	6
TOTAL	6	13	616	123
Sample	**4**	**8**	**123**	**142**

medicinal preparations were selected as Level 2 Medicines from the Essential Drug List (EDL) and treatment guidelines (Second Edition) published in 2000 by the Ministry of Health of Yemen.

The list categories level of health care into 4 levels:

Level 1: Health units in rural areas only

Level 2: Polyclinic or health centre

Level 3: Hospitals

Level 4: Referral hospitals

This list was taken as a marker for drugs that should be available in all polyclinics, hospitals and community pharmacies which are all privately owned. All functional polyclinics and hospitals were included in the sample and 20% of pharmacies were randomly selected in each district (that is–every 5th pharmacy was selected from a list). The sample size is well above the level to give 95% confidence limit. Data was collected in a pre-designed form (Appendix 1). At the same time, information regarding the operational state of the establishment during the conflict period was included *i.e.* working time, availability of regular supply, electricity and refrigeration (Appendix 1). Prices of the preparation pre and post conflict were also noted (Table 2). The survey was conducted during September and November 2016 (4 months after the rebels were removed from Aden). Direct questioning of the responsible personnel was used to explore the functional status of the facility during the conflict period (Appendix 1).

Analysis of data was done using Epi Info software of the Centre for Disease Control (CDC) and Microsoft Excel Spreadsheet (Office 2016). Impact on health services and the sequence of the armed conflict on the health of population were collected from the reports of The United Nations (UN), primarily the United Nations International Children's Emergency Fund (UNICEF*)* and the World Health Organisation (WHO). Other organizations working in the area during the conflict also provided data.

Table 2. Showing prices of medicine and the increase post conflict period.

Medicine	Phar. Group	Indication	% increase	Generic price	Branded. price	Mean price
Amox + Clav Cap	AB	tonsilitis	80	1000	1800	1400
Amox + Clav Syp	**AB**	bronchitis	59	880	1400	1140
Amox + Clav Syp inf	**AB**	pneumonia	142	600	1450	1025
Amoxicillin 500mgap.	AB	pneumonia	25	120	150	135
Amoxicillin Syp	AB	pneumonia	21	330	400	365
Amoxicillin Inj	AB	pneumonia	25	200	250	225
Ceftriaxone inj	AB	sepsis ,	25	400	500	450
P.Penicillin inj	AB	RTI	169	130	350	240
Chlorphenaramine .	AA	allergies	150	40	100	70
Hydrocortisone inj.	AA	allergies	150	100	250	175
Valproic acid	CNS	epilepsy	126	420	950	685
Diazepam inj	CNS	Seizure	100	100	200	150
Chlorpromazine	CNS	psychosis	190	200	580	390
Adrenaline inj	CV	anaphylaxis	17	300	350	325
Ca.ch.blocker	CV	hypertension	60	500	800	650
GTN	CV	angina	20	2500	3000	2750
Methyl dopa	CV	hypertension	0	250	250	250
Propnalol 40 mg tab	CV	hypertension	19	800	950	875
ORS	ELEC	Diarrhoea	40	50	70	60
Na.	ELEC	dehydration	25	200	250	225
Ringer lactate	ELEC	dehydration	25	200	250	225
Insulin inj.	HOR	diabetes	88	800	1500	1150
Metformin	HOR	diabetes	50	500	750	625
Artesunate inj	Amal	Malaria	50	800	1200	1000
Artesunate tab	Amal	Malaria	50	500	750	625
Mg.sulphate	PREG	Women	25	200	250	225
Oxytocin	PREG	Women	200	1000	3000	2000
Salbutamol spray	RES	As*thma	50	500	750	625
Salbutamol tab	RES	Asthma	70	100	170	135
Average			**71%**			

AB = Antibacterial, AA = Anti allergic Hor = Hormones, Res = Respiratory *Prices in Yemeni Rial.*

3. Results

Assessment of the impact conflict had on the availability and cost of medicines was only feasible from 4 months after rebels were forced out of Aden. 36 dosage forms (Appendix 1) were selected from the Yemen EDL (2000) and checked; their availability in 142 health institutions, public hospitals, polyclinics and pharmacies were included in the survey (Table 1). Table 3 shows the 36 medici-

Table 3. Showing availability of medicine indicators at 142 health facilities.

Medicine	Frequency available	Dose forms	units surveyed	TOTAL	% availability
Ringer	131	1	142	142	92.3
NaCl	124	1	142	142	87.3
Ceftrioxone	124	1	142	142	87.3
ORS	120	1	142	142	84.5
captopril	119	1	142	142	83.8
Metformin	116	1	142	142	81.7
Hydrocortisone	115	1	142	142	81.0
Amoxicillin	345	3	142	426	81.0
Amox + Clav	330	3	142	426	77.5
Salbutamol	205	2	142	284	72.2
mixed insulin	102	1	142	142	71.8
Propranalol	100	1	142	142	70.4
P.Penicillin	98	1	142	142	69.0
Methyldopa	97	1	142	142	68.3
Chlorphenaramine	94	1	142	142	66.2
Valprioc acid	84	1	142	142	59.2
rapid insulin	79	1	142	142	55.6
Mg Sulphate	78	1	142	142	54.9
Artesnuate	140	2	142	284	49.3
Adenaline	70	1	142	142	49.3
Chlorpromazine	64	1	142	142	45.1
GTN	62	1	142	142	43.7
Diazepam	59	1	142	142	41.5
Phenytoin	116	2	142	284	40.8
Imipramine	54	1	142	142	38.0
Chlorphenaramine	103	2	142	284	36.3
BCG	8	1	142	142	5.6
Polio.vacc	0	1	142	142	0.0
Total		36			
Average availability					**60.5**

nal preparations surveyed at 142 units. A number greater than 142 indicates that there was more than one dosage form for the same medicine that was included in the list. It would be a multiple of 142 depending on the number of the dosage forms shown in column 3.The total average availability of the 36 medicinal preparations was 60.5%; IV Fluid had the highest availability whereas vaccines had the lowest.

The prices of preparations as shown in Table 3 show the generic and the branded price preparation. The mean price was used for the comparison of pre and post conflict prices. It was found that there was an increase of 71% post-conflict compared to the prices pre conflict.

3.1. Impact on Health Infrastructure and Health Services

Information regarding the performance of health facilities and health services during the conflict (March to July 2015) were obtained by direct questioning of health personnel during the survey (Appendix 1). Out of 6 hospitals, only 2 hospitals were functioning. Out of 12 Polyclinics, 9 were functional. 351 Pharmacies out of 616 were non-operational and 123 were partly functional. The average percentage of non-functional health facilities were 24.5% and the percentage of partly functional health facilities were 11.25% (Table 4). The definition of partly functional is staff that didn't work every day due to lack of electricity, staff shortages or safety issues.

All health facilities and pharmacies were closed in 3 out of 8 districts, (Crater, Maalla & Tawahi) due to continuous shelling and snipers. The medical supplies system was severely hindered; the Central Medical Stores (responsible for supplying Aden, Lahj, Abyan and Taiz governorates) were closed and physically occupied by the rebels. Pharmacies in Mansoorah and Shaikh Othman were partly functioning.

Table 5 indicates 25% of hospitals were not supplied, further investigations revealed that 75% of the hospitals were supplied with first aid materials by donations from Yemeni immigrants and purchased from local pharmacies. On the

Table 4. Showing the percentage of health institution that were not functioning or partly functioning in Aden.

Health facilty	% Not operational	% Partly operational
Hospital	25	0
Pharmacy	43	20
Polyclinic	13	25
Private clinic	17	0
Average	**24.5**	**11.25**

Table 5. Showing the status of percent of health institution that did not had medical supplies or those that were occasionally supplied.

Health facility	% Not supplied	% Partly supplied
Hospital	25	0
Pharmacy	55	23
Polyclinic	13	50
Private clinic	33	50
Average	**31.5**	**30.75**

whole, the average health facilities that were regularly supplied were 31.5%, and a similar percentage were intermittently supplied.

3.2. Obj 2: Attacks on Health Personnel and Civilians

The United Nations High Commissioner for Human Rights (OHCHR) condemned a series of attacks carried out by both conflicting parties in early 2014. Human Rights Watch, UNICEF, Office for the Coordination of Humanitarian Affairs (OCHA) and other organizations reported over 25 incidents attacking health facilities and health personnel. These included kidnapping and detaining health workers, transporting medicines, killing and injuring nurses, deploying snipers in and around hospitals and hijacking ambulances to use for military purposes. The following incidents pertaining to Aden were reported by Human Rights Watch International and other international agencies [4]:

1) A bus carrying staff members from a military hospital in Aden on June 15, with six fatalities and nine wounded.
2) Seven people died on September 9 from gunshot wounds, including an ambulance driver whilst on route to collect the wounded.
3) Checkpoint refused to allow the aid of the wounded.
4) According to UNICEF, armed clashes in Southern Yemen have inhibited the delivery of supplies to hospitals due to safety issues.
5) On April 18 2015, Houthi forces in the city of Lahj, Yemen, entered the Ibn Khaldun Hospital and deployed snipers in nearby buildings and stationed a tank at the hospital entrance.
6) OCHA reported on April 23 2015, that the water tanks in Al Jumhouria Hospital and Al Maalla Health Complex in Aden were damaged by fighting, and both health facilities had no water.

3.3. Consequences of the Armed Conflict on Health of Population

Armed conflict in general has a negative effect on a population. The impact of conflict extends far beyond the number of soldiers and civilians who die in combat. It also contributes to excess mortality and morbidity in the civilian population largely through the spread of infectious disease, destruction of assets, the loss of entitlements, and the diversion of scarce resources away from basic services.

With the impact of the crisis unfolding there have been challenging setbacks particularly in the economy and employment levels. There has been an accumulation of waste in various areas of the city, due to collapsing social services and a severe fuel crisis. As a result, residents of Aden suffered from various diseases including dengue fever, malaria and cholera.

3.4. Outbreak of Infectious Diseases

According to WHO, [3] "...of the 92 Electronic Disease Early Warning and Response System (eDEWS) generated alerts for Week 27, there were altogether 20 alerts for dengue fever, 18 bloody diarrhoeas, 12 pertussis, 11 measles, 9 cutane-

ous leishmaniosis, 8 acute viral hepatitis, 5 schistosomiases, 4 acute flaccid paralyses, 3 meningitis, and 2 viral haemorrhagic fever received."

The Higher Medical Public Committee Aden (HMPCA) saw 70 notifications for suspected malaria, dengue and unknown fever in week 27 (2015). 278 suspected cases of dengue fever were reported in 9 governorates, and 8 additional cases with haemorrhagic manifestations were reported in 2 governorates through eDEWS sentinel sites (5 of the haemorrhagic manifestations were in Aden). Aden continued to be the most affected by suspected dengue and viral haemorrhagic fever. The governorate had lost nearly all regular eDEWS communicable disease surveillance reporting sites due to the conflict. Diarrhoeal diseases comprised 6.3% and pneumonia 2.45% of total morbidity in the under five age group. In view of the conflicting reports from The WHO and other organizations on the outbreak of cholera, we had to rely on what had been reported by the Aden Health Office in October 2016, as 86 suspected cases and 7 fatalities.

3.5. Internal Displacement

The Task Force on Population Movement 10th report (July 2016), [3] estimates that the total internally displaced population in Yemen was 2.21 million. Aden alone had 1.2% (26,520): 25% men, 28% women and 47% children. Epidemics that develop during armed conflict are often due to displacement of large populations to unhygienic and overcrowded camps which provide a fertile breeding ground for infections (ICRC 1996a) [5]. The impact of communicable diseases reaches all conflict affected Internally Displaced Persons (IDPs), host communities, and the non-displaced/non-hosting communities. Malaria, acute respiratory infections, diarrhoeal diseases, and measles are responsible for most indirect deaths in conflict zones and probably other diseases that are likely to occur, by means of transmission, such as:

- Air droplet: Tuberculosis, measles, meningitis, whooping cough, pneumonia
- Faecal-oral: Diarrhoeal diseases as cholera, typhoid, hepatitis, amoebiasis, giardiasis, bacillary dysentery, typhoid fever, ascariasis, ancylostomiasis, and polio
- Vector-borne: Malaria, dengue fever, schistosomiasis, typhus, Japanese encephalitis, trypanosomiasis, yellow fever, onchocerciasis
- Blood: Human Immunodeficiency Virus (HIV), Hepatitis B & C
- Sexual: HIV, syphilis, Hepatitis B, gonorrhoea and other Sexually Transmitted Diseases
- Unclean wounds: Infections, tetanus
- Mother to child: Hep. B, HIV, Syphilis.

Some of these diseases are already endemic in Aden, but the incidence rate increased drastically.

Displaced populations can transfer infections from their home environment or the area they travelled through to new areas of settlement, where these infections were previously unknown or under control. Likewise, incoming locally

displaced populations can experience increased mortality and morbidity if exposed to new diseases to which they have not developed specific immunity. Disease control programmes such as mass vaccination deteriorated due to armed conflict. Non-communicable diseases, chronic illness, disability, and malnutrition brought on by displacement often claim more lives and cause greater suffering than the conflict itself. Older age is characterized by decreased mobility, sight, hearing and frailty. Minor ailments become serious handicaps which impair older person's coping and have challenges accessing medical services and frequently face a lack of understanding, and medications.

Persons with disability do not present a homogeneous group. In situations of armed conflict, they have the same basic needs as other affected persons. In addition to this they may experience difficulty in moving, hearing, seeing, communicating and/or learning; amplifying the severe challenges posed by displacement. Chronic diseases common to older age, such as coronary heart disease, hypertension, diabetes and respiratory diseases can worsen without adequate routine assessment and medication (UNHCR/HAI 2008). Similarly, disability can result from poorly managed chronic illnesses during periods of protracted conflict.

Conflict leads directly to the death and injury of combatants. Torture causes specific health care needs, as do landmines, unexploded ordinances (UXO), and other remnants of war. UXOs not only cause immediate death and injury to conflict affected populations, but continue to cause disability and death beyond the life of the conflict (Anna's and Geiger, 2008). Sexual violence increases during armed conflict resulting in high rates of pregnancy, STDs, and HIV. However, the total number of people dying violently during conflict is relatively low compared to those dying or being impacted indirectly from armed conflict. Sustained conflict leads to lower levels of nutrition as access to food decreases. The nutrition status of all affected people will be impacted by food shortages in the short and long term. Common consequences of conflict in food security among affected populations include:

- Reduction in the availability and access to food
- Loss of or damage to family food reserves
- Decrease in both number and quality of meals.

Those who are already vulnerable-children under five, the elderly, the disabled, those with chronic illnesses, persons with HIV/AIDs and those with already compromised nutritional status will be most impacted. Severe acute malnutrition will appear and be measurable from the second month of displacement.

A major health consequence of violent conflict is the disruption to the pharmaceutical supply chain resulting in inaccessibility to lifesaving medicines, operating theatres, vaccines and response to medical emergencies as well as basic services including electricity, fuel and transport. However, these are only one aspect of the problem caused by the direct effect of the armed conflict.

The second blow to the medical supply system is caused by the inherited cen-

tralized logistic administrative set up for licensing, procurement, storage and distribution system that remained centralised in Sanaa. Since the rebels are now holding the state at ransom, all supplies and financial allocations for supplies has been stopped and will continue to be so until the conflict is resolved. The Aden Central Medical Store is also responsible for the medical supplies to Taiz, Lahj and Abyan and thus these governorates will also be affected.

4. Conclusions

The results show a 71% increase in prices of lifesaving medicine at private pharmacies. It is important to understand that this survey was done when the major events of the confrontation has already subsided. A recent survey by the Ministry of Public Health and Population in Sanaa indicated that 80% of medicines that were available were also smuggled and about 40% were substandard or even devoid of any active ingredients. This poses a dangerous health problem unless it is resolved very quickly. Even before the armed conflict began over 50% of the population in Yemen were living well below the poverty line. It was very common for families to sell their properties to be able to buy medicine [5]. Difficulty accessing health services due to lack of transport, fuel and inability of the authorities to pay salaries for those who are employed is yet another burden of the conflict.

The armed conflict of 2015-2016 brought the health services in Aden to the edge of collapse and about 50% of health facilities were deemed inoperative. The only medical supplies that are available now come via donation from the Gulf States and Saudi Arabia; this is insufficient due to the collapse of the medical supply system. In the absence of basic services, displacement and loss of property there has been an increased level of poverty, and psychological suffering as well as a substantial rise in mortality and morbidity as a result of a rise in epidemics.

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Appendix 1

		Pharmacy	Pr.Clinic		Hospt		
	INSTITUSION			☒			Tick where approp Write the name
	DISTRCT			**Seerah**			
		Operation	**Supply**	**Fredge**			
		Yes	Yes	Yes			
		No	No	No			
		Occtional	Occtional	Occtional			
	Medicine	**Category**	**Indication**	**Available**	**Min.Price**	**Max.Price**	**Mean Price**
1	Amox+Clav Cap	AB	RI	Yes/No	X	X	#VALUE!
2	Amox+Clav Syp	**AB**					
3	Amox+Clav Syp inf	**AB**					
4	Amoxicillin 500mg caps	AB					
5	Amoxicillin Syp	AB					
6	Amoxicillin Inj	AB					
7	Ceftrioxo inj	AB	Pneumonia				
8	P.Penicillin inj	AB					
9	Chlorphenaramine inj.	AH	Shock				
10	Hydrocortisone inj.	HOR	Shock				
11	Phenytoin	CNS	Epilepsy				
12	Phenytoin	CNS					
13	Valproic acid	CNS					
14	Diazepam inj	CNS	Convulion				
15	Imipramine	CNS					
16	Chlorpromazine	CNS					
17	Adrenaline inj	CV					
18	Ca.ch.blocker	CV					
19	GTN	CV					
20	Methyl dopa	CV					
21	Propnalol 40mg tab	CV					
22	ORS	ELEC					
23	Na.	ELEC					
24	Ringer lactate	ELEC					
25	Insulin inj.	HOR					
26	Metformin	HOR					
27	Artesunate	APAR					
28	Artesunate	APAR					
29	Artesunate	MAL					

Continued

30	Artesunate	MAL
31	Mg.sulphate	PREG
32	Oxytocin	PREG
33	Salbutamol	RES
34	Salbutamol	RES
35	BCG	VAC
36	Polio	VAC