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PARETO ANALYSIS IMPLEMENTATION FOR COVID-19 OUTBREAK HUMANITARIAN SUPPLY CHAIN BY INDONESIAN NATIONAL DISASTER AGENCY (BNPB) MARCH – JUNE 2020

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Abstract: COVID-19 outbreak impacts the fluctuation of medical kit in Indonesia and around the world. When everyone is trying to donor the relief, without knowing the real demand, it could be oversupplied. Furthermore, when this pandemic ends, the relief could be useless. The humanitarian supply chain has a role in ensuring the flow of relief aid and providing effective and efficient related information . The use of Pareto analysis could help finding what are the most needed items in handling disaster. In this paper, the researchers are trying to find if there is inefficiency in distributing the relief to the beneficiary by calculating the percentage of received and distributed relief aid to avoid overstock or out-of-stock case. Moreover, the researchers also look for possibilities of distribution efficiency.

Keywords: COVID-19 outbreaks, Medical kit, Humanitarian supply chain, Pareto analysis, Overstock, Distribution efficiency.

Introduction

Indonesia is located in a disaster-prone area due to the geographical, geological, and demographic condition. There are three types of disasters in Indonesia which are natural disasters, un-natural disasters, and social disasters. The natural disasters are earthquake, *tsunami*, volcano eruption, flood, landslide, etc. The un-natural disasters are technology failure, land and forest fire, epidemic, and disease. The social disasters are social conflict among groups or communities and terror (Wibowo et al., n.d.)

The Indonesian National Disaster Agency (BNPB) noted that the natural disaster occurred in 2019 has increased compared to the previous year. Until December 27, 2019, BNPB said there were 3,768 natural disasters in Indonesia. While in 2018, there were 3,397 natural disasters recorded. This year, 2020, only a few hours after New Year's Eve, Jakarta and its surroundings are were hit by floods. Soon after the flood issue, COVID-19 outbreak has already entered Indonesia. COVID-19 is categorized as unnatural disaster. It means Indonesia is struck by two disasters at the same time and any disasters has victims that needed help.

The humanitarian supply chain is needed to ensure the flow of relief aid and to provide effective and efficient information of the victims and the donors to minimize human suffering and death running. In humanitarian supply chain, numerous parties are involved such as the Indonesian and/ other countries government, Non-Government Organization or NGO, the Donors, the ilitary, the Suppliers, the Media, and even the Private Businesses. Although involving many parties, the most powerful decisions are still coming from the government because they have the power to control political and economic conditions which directly impact the supply chain process. Unlike the regular supply chain which has stakeholders as the "owners" of the chain, humanitarian supply chain activity does not focus on getting profit. It is merely volunteer and donors to save people (Ergun et al., 2009) .

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There are several operational characteristics of humanitarian supply chain or relief chain during natural disaster and unnatural disaster such as the challenges of an unpredictable demand, time, location, type and size of the relief, the fluctuation of the demand with very short lead time and in a wide variety of supplies, resource scarcity (supply, people, technology, money). However, sometimes, it could be oversupply or lack of supply, and many uncertainties might happen. To get a clear idea about the stock details, stock availability and demand need to be adjusted (John et al., 2012) . A humanitarian aid organization is responsible to ensure the donation reach the beneficiary as expected. Thus, it is important to design plans and execute them intelligently. A good plan and forecaste in procuring the relief could reduce the possibility of oversupply, stock-outs, and the expiration of goods, which also affect in time-saving and costs' reduction (van der Laan et al., 2016) Moreover, it is seen as an effort to accelerate disaster handling in saving human lives and could offer accountability to donors and the public in general.

There are three main objectives of this paper. First, the researchers want to find out kinds of medical kit needed the most for COVID-19 pandemic in order to copy the same procurement practice in the future. It is needed in case Indonesia face the same kind or even worse pandemic. Second, the researchers try to evaluate the efficiency of medical kit distribution by analyzing the demand and the actual distribution. Third, the researchers want to look for possibilities for further improvement in warehousing.

Method

This study applied a quantitative approach with primary and secondary sources. The primary data was collected through in-depth interview with Indonesian National Disaster Agency (BNPB) staff, while the secondary data was gathered from Directorate of Logistics Network and Equipment Optimization, Indonesian National Disaster Agency (BNPB). The research interests are the flow of distribution, needs of the relief aid, effectiveness in relief aid distribution, and efficiency in distribution.

The first step was data filtration from many documents collected, which result in three documents to be analyzed. The documents are Standard Operating Procedure (SOP) to distribute health material, delivery report, and receive report. The second step was the data analysis in the form of a flow chart, Pareto table, and Pareto chart. Pareto analysis is also known as 80/20 rule, whereas approximately 80% of the effects come from 20% of the causes. (Stojčetović et al., 2015) It also means a small percentage of input can generate a large percentage of output. Pareto tool is proven to be useful and easy to use in management decision making. (Talib et al., 2015) To analyze easely, the scope is limited to the medical kit only in Jakarta from March to June 2020.

Discussion and Result

1. The Flow of Distribution

The flow of relief chain is started with an order from hospital to the regional task force, then to the central task force. If the order is not available, then the central task force needs to make an order to the supplier. The relief supply comes from two sources.

First, the relief is procured by theIndonesian National Disaster Agency using state-budget and the second relief is coming from domestic or international aid, such as from society, private business, foundation, association, media, and even from a

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foreign government. The relief will be placed in four different warehouses, which are *Halim* Warehouse, Central Crisis Warehouse, PT. Bhanda Ghara Reksa Warehouse and *Kelapa Gading* Warehouse. After the distribution plan is ready, the relief is carried by a provincial liaison to the Regional Task Force outside JavaIsland and all Javaespecially to designated hospitals.

The whole process will take around 6-7 days from the supplier until the cargo arrives at the beneficiary if the requested relief by the hospital is not available. For this analysis, the researchers only used data from Jakarta which contributed to the biggest distribution case. The relief distribution from the supplier to the beneficiary can be seen in Figure 1.

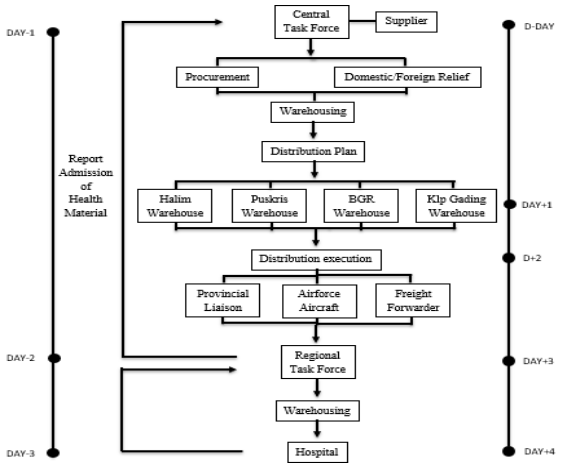

Figure 1

Source: Indonesian National Disaster Agency (BNPB)

2. The Need for Relief

Based on the data collected, the researchers compiled d all kind of medical aid from four warehouses, which are *Halim* warehouse, *Pusat Krisis (Puskris)* or Central Crisis warehouse, PT. Bhanda Ghara Reksa (BGR) warehouse, and *Kelapa Gading* warehouse. There are 67 items with total quantity of 9,564,177 units as shown in Table 1 below. By using the Pareto analysis for the data distribution, the research got the chart as follow:

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Table 1. Distributed Item from March-June 2020

No.	Item	Sum of Total	Percentage Accumulation	Quantity Accumulation	Percentage
1	MASKER BEDAH	6,054,139	63.30016%	6,054,139	63.30016%
2	APD	662,990	70.23217%	6,717,129	6.93201%
3	HANDSCOONE NON STERIL	516,900	75.63671%	7,234,029	5.40454%
4	MASKER KAIN (GDG PUSKRIS)	500,000	80.86455%	7,734,029	5.22784%
5	MEDICAL GLOVES	418,600	85.24130%	8,152,629	4.37675%
6	RAPID TEST (NON DSP)	279,140	88.15990%	8,431,769	2.91860%
7	REAGENT PCR (DSP)	141,300	89.63729%	8,573,069	1.47739%
8	MASKER N95	133,675	91.03495%	8,706,744	1.39766%
9	VTM / UTM - (DSP)	117,200	92.26036%	8,823,944	1.22541%
10	REAGENT RNA (DSP)	103,650	93.34409%	8,927,594	1.08373%
11	REAGENT PCR (NON DSP)	100,624	94.39618%	9,028,218	1.05209%
12	LACTOBACILLUS / LAKTOBASILUS	81,000	95.24309%	9,109,218	0.84691%
13	VTM / UTM - (NON DSP)	64,992	95.92263%	9,174,210	0.67954%
14	COTTON SWAB / DACRON	56,112	96.50932%	9,230,322	0.58669%
15	THROAT SWABS	50,016	97.03227%	9,280,338	0.52295%
16	FACE SHIELD	38,206	97.43174%	9,318,544	0.39947%
17	REAGENT RNA (NON DSP)	37,440	97.82320%	9,355,984	0.39146%
18	AZITROMICIN (AZITHROMYCIN)	32,000	98.15778%	9,387,984	0.33458%
19	BOUFAN CAPS	31,495	98.48708%	9,419,479	0.32930%
20	LEVOFLOXACIN / LEVOFLOKSASIN 500MG	30,000	98.80075%	9,449,479	0.31367%
21	PE GOWN	23,980	99.05148%	9,473,459	0.25073%
22	KACAMATA (GOGGLES)	16,136	99.22019%	9,489,595	0.16871%
23	TUBE RNA (NON DSP)	14,400	99.37076%	9,503,995	0.15056%
24	HANDSCOONE STERIL	12,255	99.49889%	9,516,250	0.12813%
25	LEVEL 2 HIGH RISK ISOLATION GOWN	8,700	99.58985%	9,524,950	0.09096%
26	OBAT BATUK	8,000	99.67350%	9,532,950	0.08365%
27	VIPRO-G	5,817	99.73432%	9,538,767	0.06082%
28	HANDSANITIZER BOTOL (GDG PUSKRIS)	4,273	99.77900%	9,543,040	0.04468%
29	HAZMAT SET (GDG PUSKRIS)	3,500	99.81559%	9,546,540	0.03659%
30	HAND SANITIZER 500 ML	3,480	99.85198%	9,550,020	0.03639%
31	HANDSANITIZER LITER (GDG PUSKRIS)	3,400	99.88753%	9,553,420	0.03555%
32	LEVOFLOXACIN / LEVOFLOKSASIN 750MG	3,216	99.92115%	9,556,636	0.03363%
33	SHOE COVER	1,745	99.93940%	9,558,381	0.01825%
34	SARUNG TANGAN PANJANG	1,010	99.94996%	9,559,391	0.01056%
35	BAJU UNIQLO WANITA	800	99.95832%	9,560,191	0.00836%
36	HAND SANITIZER 250 ML	600	99.96460%	9,560,791	0.00627%
37	SUPLEMEN VITAMIN	500	99.96982%	9,561,291	0.00523%
38	VITAMIN C PROTECAL C-200	360	99.97359%	9,561,651	0.00376%
39	CAIRAN DISINFEKTAN	294	99.97666%	9,561,945	0.00307%
40	VITAMIN SANBE BECOM C	234	99.97911%	9,562,179	0.00245%
41	IMBOOST FORCE (1 BOTOL @300 TABLET)	228	99.98149%	9,562,407	0.00238%
42	K POWER	224	99.98384%	9,562,631	0.00234%
43	BAJU UNIQLO PRIA	200	99.98593%	9,562,831	0.00209%
44	BETHADYN BODY WASH	200	99.98802%	9,563,031	0.00209%
45	ISOLATION SUITE	200	99.99011%	9,563,231	0.00209%
46	HYDROXYCHLOROQUINE (HCQ) / HIDROKSIKLOR	190	99.99210%	9,563,421	0.00199%
47	NURSE CAP	160	99.99377%	9,563,581	0.00167%
48	HAND SANITIZER 5 L	60	99.99440%	9,563,641	0.00063%
49	VIT C	60	99.99502%	9,563,701	0.00063%
50	HAND SANITIZER JIRIGEN	52	99.99557%	9,563,753	0.00054%
51	HANDWASH 5 L	52	99.99611%	9,563,805	0.00054%
52	ENESIS PAKET A	50	99.99663%	9,563,855	0.00052%
53	RAPID TEST ANTIGEN / PCR ANTIGEN (DSP)	50	99.99716%	9,563,905	0.00052%
54	WASH LAP	50	99.99768%	9,563,955	0.00052%
55	HANDSANITIZER PACK (GDG PUSKRIS)	34	99.99803%	9,563,989	0.00036%
56	LAPIN MULTIPURPOSE DISINFECTANT WIPES	30	99.99835%	9,564,019	0.00031%
57	8 STRIPS SWAB	26	99.99862%	9,564,045	0.00027%
58	THERMOMETER INFRARED (THERMO GUN)	26	99.99889%	9,564,071	0.00027%
59	STARCLEAN DV (DESINFEKTAN)	25	99.99915%	9,564,096	0.00026%
60	DISPOSABLE WIPES	17	99.99933%	9,564,113	0.00018%
61	PORTABLE VENTILATOR	16	99.99950%	9,564,129	0.00017%
62	CPAP GDG PUSKRIS	15	99.99965%	9,564,144	0.00016%
63	DISINFECTANT SPRAYER	10	99.99976%	9,564,154	0.00010%
64	SEPATU BOOT	10	99.99986%	9,564,164	0.00010%
65	THERMOMETER / TERMOMETER	10	99.99997%	9,564,174	0.00010%
66	MESIN PCR (NON DSP)	2	99.99999%	9,564,176	0.00002%
67	PLOSSA	1	100.00000%	9,564,177	0.00001%
	Grand Total	9,564,177			100.00000%

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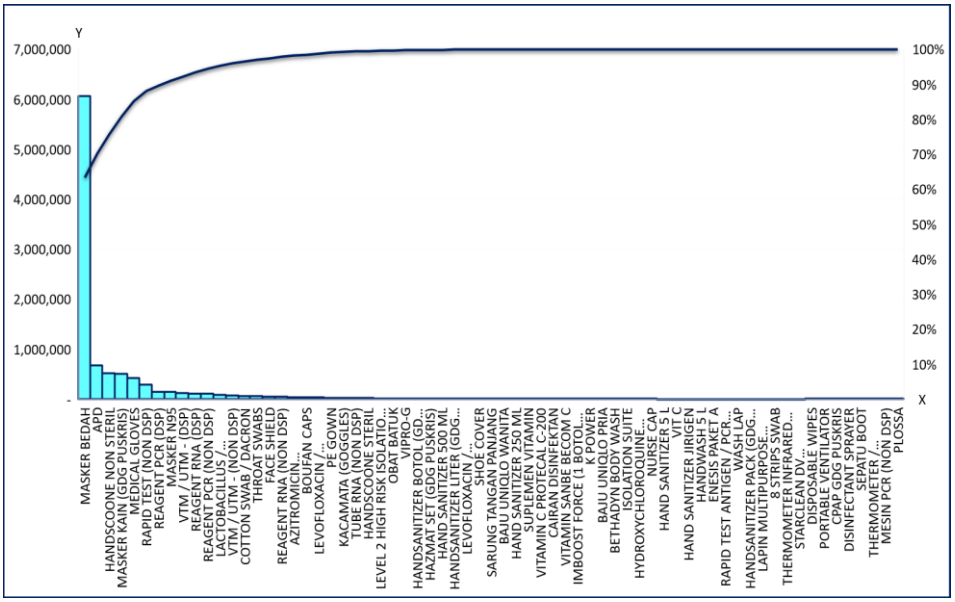

Figure 2. Pareto Chart

From the Pareto chart in Figure 2, there are four items accounted for 80% of percentage accumulation. Those items are surgical mask, personal protective equipment, non-sterile handscoon, and cloth mask. Those four items are the priority in procurement when this kind of pandemic might happen again in the future.

3. The Effectiveness of the Distribution

To find out the effective distribution of the four prioritized items, the researchers analyzed the receiving and distribution of the goods (see Table 2). By calculating average usage or average demand each month and compared with the inventory by the end of June, the research got DOS (days of stocks) or MOS (months of stocks) figures for each item (see Table 3).

Table 2. The Amount of Received and Distributed Medical Aid

No	Item	March		April		Mei		June	
		In	Out	In	Out	In	Out	In	Out
1	MASKER BEDAH	14,028,684	2,056,350	2,361,960	561,334	4,127,250	2,226,375	3,370,080	1,210,080
2	APD	390,395	97,790	1,729,412	203,204	2,316,091	324,805	420,984	36,770
3	HANDSCOONE NON STERIL	695,000	4,000	594,000	157,100	19,600	339,600	105,000	16,200
4	MASKER KAIN (GDG PUSKRIS)	-	-	500,000	-	-	500,000	-	-

Table 3. Needs Analysis

No	Item	Needs Analysis (In Four Months)					
		In	Out	Avg usage	Stock end June	MOS	Distributed presentage
1	MASKER BEDAH	23,887,974	6,054,139	1,513,534.75	17,833,835	12	25%
2	APD	4,856,882	662,569	165,642.25	4,194,313	25	14%
3	HANDSCOONE NON STERIL	1,413,600	516,900	129,225.00	896,700	7	37%
4	MASKER KAIN (GDG PUSKRIS)	500,000	500,000	125,000.00	-	0	100%

From Table 3, the research found that Months of Stocks / MOS are not efficient

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enough. The stocks of the first three items, ie.surgical mask, personal protective equipment, and non-sterile handscoon are too high, while the stock of cloth masker is nil. This might be caused by the demand which is not real, a mistake in forecasting, the inefficiency when ordering, procurement, and distribution process. The researchers did not analyze the cause of uneven MOS / Months of Stocks due to limited resources from end-users.

4. The Efficiency of the Distribution

Table 4. Amount of Received Medical Kit

No	Item	Received / In			
		Halim	Puskris	BGR	KLP Gading
1	MASKER BEDAH	846,334	15,215,050	7,347,430	479,160
2	APD	4,140,250	445,845	248,231	23,181
3	HANDSCOONE NON STERIL	-	1,413,600	-	-
4	MASKER KAIN (GDG PUSKRIS)	-	500,000	-	-

Table 4 above showed the amount of each medical kit received by each warehouse. It could be seen that the biggest quantity is at Pusat Krisis (Puskris) or Central Crisis warehouse. Then, the research could compare the capacity in Puskris or Central Crisis with the amount of distributed medical kit from all warehouses. If it is based on the overall demand, the stock result and the average usage each month could be checked by the end of June. Then, a distributed percentage could be known which presented in Table 5 below.

Table 5. Data Analysis in Puskris Warehouse

No	Item	Puskris warehouse					
		Received / In	Overall Warehouse Out	Stock end June	Avg usage	Distributed presentage	Stock remaining in Months
1	MASKER BEDAH	15,215,050	6,054,139	12,760,730	1,513,535	40%	8
2	APD	445,845	662,569	- 216,724	165,642	149 % - 100 % = -49% (216.724)	APD From BGR should be moved to Puskris
3	HANDSCOONE NON STERIL	1,413,600	516,900	896,700	129,225	37%	7
4	MASKER KAIN (GDG PUSKRIS)	500,000	500,000	-	125,000	100%	0

The analysis came up with the summary that if one warehouse was optimized only for receiving and distributing medical kit in Jakarta, in Pusat Krisis (Puskris) or Central Crisis warehouse, the surgical mask efficient distribution could be increased by 15%. The analysis also showed that there was a lack of personal protective equipment demand in Puskris, therefore, to optimize Puskris warehouse the personal protective equipment from BGR warehouse should be moved, to Puskris warehouse. For non-sterile handscoone and fabric mask (GDG Puskris) in number 3 and 4, remain the same since only Puskris warehouse that received and distributed this medical kit.

It can be concluded that most priority items could be distributed in one central warehouse which is Pusat Krisis (Puskris) Warehouse, with the benefit as follow: (1) The transport cost could be reduced, (2) Increase warehouse occupancy, (3) Space in another warehouse could be used for other medical kits, (4) Medical kit control could become easier.

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Conclusion

COVID-19 is considered as a new un-natural disaster, which occurs in Indonesia and all over the world. No historical data available and predicted future numbers to do forecasting in procuring this kind of relief. The distribution flows if only there is an order from the hospital, which takes four days to fulfill. Oversupply and out-of-stock happen because the supply cannot be matched with unclear demand. At the beginning of COVID-19 issue, the need of medical kit in Indonesia has increased very high, but the supply is limited. Thus, medical kit production in handling COVID-19 does not enough to supply the needs in Indonesia. The procurement and distribution plan should be matched with the prediction of WHO, Indonesian Health Department, and Jakarta Government regarding the rate of COVID-19 spread in the future. This is not easy because the supply also relies on other countries that facing the same case.

The distribution of the most prioritized medical kit is not really effective. Further research needs to be done to find the root that causing ineffective distribution. We propose to use Pusat Krisis (Puskris) warehouse only for receiving and distributing relief aid in Jakarta in order to be more efficient.

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