



## ANALYSIS OF THE COST OF THE MOST OFTEN USED PROTECTIVE MEDICAL DEVICES AND MEDICINES DURING THE COVID-9 PANDEMIC IN BULGARIA

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### ABSTRACT

**Purpose:** The current study aims to analyze the economic burden of COVID-19 with respect to the direct medical cost of the most often used protective medical devices, vaccines, and medicines in Bulgaria. The point of view is that of the retail pharmacies taking into account the governmental costs for vaccines. The focus of the study is on the expenditures for protection.

**Methods:** We performed a combined inquiry and observational cost analysis. We retrospectively collected information from 2800 pharmacies representing the whole country area for the quantities sold from identical medical devices and medicines during the period September 2020 – June 2021 and calculated the cost of vaccines for the vaccinated people.

**Results:** The total cost paid by the consumers for preventive OTC medicines and medical devices is 79,6 mln BGN (appr. 41 mln Euro) for the observed pharmacies. Having in mind that the total number of pharmacies in Bulgaria is above 5000 we can assume that the costs paid by the people account for nearly 160 mln BGN. The cost for medical devices is the highest one in comparison with other preventive items. The second largest one is the cost of analgesics in combination and analgesics. The total sum paid for the applied doses of vaccines is approximately 48 892 565 BGN (appr. 26 million Euro). **Conclusion:** The COVID 19 pandemic is costly not only for the health insurance and government but also for people. People spent more for preventive goods including medical devices than the government spent for vaccines.

**Key words:** COVID – 19, cost of prevention, cost analysis, medical devices, vaccines

### INTRODUCTION

The protective measures in case of a pandemic can be divided into social measures, physical barriers against the infection spread, and vaccination [1]. The active therapy is part of the protection for the rest of the possible recipients of the infection in case of a disease development. The social measures aim to influence the surrounding environment by isolating people,

cleaning environment, ionization methods etc. The physical barriers include wearing protective masks, medical gloves, protective clothes and other. The vaccination protects the recipients by minimizing the risk of infection development in case of virus exposure [2].

In addition to those measures people are usually buying different medicines recommended either for protection or for minor ailments therapy [3]. The COVID-19 pandemic forced the health care system in a way that was unknown for the last 100 years and posed lots of challenges to the supply chain of pharmaceuticals [4]. The latter concerns the supply of active substances to manufacturers,

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supply of medicines to the pharmacies and hospitals, supply of protective devices. Many authors pointed out to the unprecedented shortages of protective commodities, medical devices, and medicines at all levels of the supply chain.

The current study aims to analyze the economic burden of COVID-19 with respect to the direct medical cost for the most often used protective medical devices, vaccines, and medicines in Bulgaria since the onset of the pandemic. The point of view is that of the retail pharmacies taking into account the governmental costs for vaccines. The focus of the study is on the expenditures for protection.

### MATERIALS AND METHODS

We performed a combined inquiry and an observational cost analysis. The first step was to perform an inquire research with 40 pharmacists to identify the most often used medicines and protective medical devices by the outpatient settings.

Then, retrospectively, information was collected from the 2800 pharmacies, representing the whole country area, for the quantities sold of identic medical devices and medicines during the period September 2020 – June 2021.

The third step was collecting information from the national information portal about the number of vaccinated people and the type of vaccines used.

The economic burden was calculated as a sum of the cost of vaccination, and cost of protective measures in outpatient settings. The prices of protective medical devices were averaged from the observed outpatient pharmacies. Then the expenditures were extrapolated to the general population. The prices of medicines and vaccines were collected from the respective annexes of the positive drug list. For OTC medicines the prices were the maximum approved retail prices and the for the prescription medicines the prices were the reference retail prices.

For the vaccines, the prices were taken from web articles from journals [5-8]. The real prices are not known because they are a subject of discounts

during the tenders. From the selected sources we took the lowest published price to be closer to the tender prices.

### RESULTS

In the inquiry several major groups of protective items and medical devices were identified and those were disinfectants, face masks (medical and plastic), gloves (**Table 1**). Out of the OTC medicines, pharmacists reported for intensive search of analgesics, vitamins, minerals, and their combinations.

The total cost paid by the consumers for preventive OTC medicines and medical devices is 79,6 mln BGN (appr. 41 mln Euro) for the observed pharmacies. Having in mind that the total number of pharmacies in Bulgaria is above 5000 we can assume that the costs paid by the people account for nearly 160 mln BGN.

It is not surprising that the cost of the medical devices is the highest one in comparison with other preventive items. The second largest one is the cost of analgesics in combination and analgesics (**Figure 1**). The prescription medicines reported to be prescribed for protection are antibiotics (**Table 2**). It is not clear whether the prescribed antibiotics were used for minor ailments or in case of home self-care during moderate infection. We decided to include the cost paid for antibiotics due to the fact that almost all of the interviewed pharmacists reported a significant increase of the sales of antibiotics during the observed period. The total cost of antibiotics is 35 mil BGN for the observed pharmacies or approximately 70 mln BGN (36 mln Euro) for the whole country.

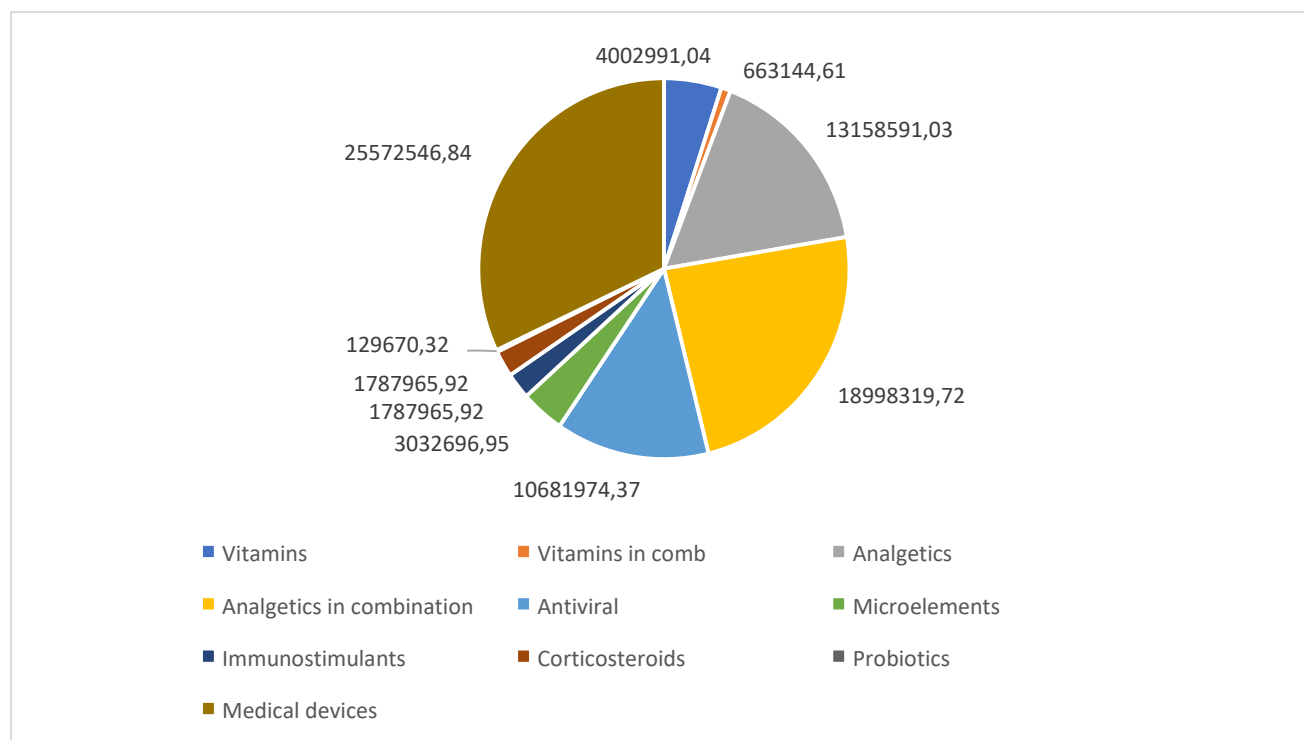
At the end of August according to the United information portal 2 265 375 doses of vaccines were applied and 1 136 590 residents were with completed vaccination. The approximate number of applied doses of vaccines per INN is presented in Table 3. The total sum paid for the applied doses is approximately 48 892 565 BGN (appr. 26 million Euro).

Finally, the total cost for all preventive items including vaccines account for nearly 200 mln BGN including the cost of antibiotics.

**Table 1.** Type and cost of preventive medicines and medical devices

<b>Therapeutic group</b>	<b>Product (INN)</b>	<b>Quantity</b>	<b>Price</b>	<b>Cost</b>
Vitamins	Ascorbic acid (Vitamin C)	1459072	1,69	2465831,68
	Cholecalciferol (Vitamin D3)	370854	2,66	986471,64
	(Alfacalcitriol) Vitamin D	26629	20,68	550687,72
Vitamins comb	Vitamin D3 + Ca	5488	10,47	57459,36
	Ascorbic acid + Calcium	23095	5,24	121017,8
	Ascorbic acid + Paracetamol + Pseudoephedrine hydrochloride + Dextromethorphan hydrobromide	35452	4,9	173714,8
	Vitamin C+Zn+Sn+D3	28692	8,19	234987,48
	Vitamin D3, Ca,Mg,Zn	2527	5,23	13216,21
	Vitamin C + Zn + D3	7566	5,09	38510,94
	Vitamin D3+Sn+Zn+Vitamin C	2612	5,63	14705,56
	Vitamin C + Zn +D3	994	9,59	9532,46
Analgetics	Acetylsalicylic acid	3010839	2,19	6593737,41
	Paracetamol	2970522	2,21	6564853,62
Analgetics in comb	Acetylsalicylic acid + Pseudoephedrine	23313	11,46	267166,98
	Acetylsalicylic acid + Ascorbic acid	446258	11,19	4993627,02
	Paracetamol + Guaifenesin + Phenylephrine hydrochloride	81431	11,69	951928,39
	Paracetamol + Phenylephrine	408240	8,9	3633336
	Paracetamol + Phenylephrine hydrochloride + Ascorbic acid	201562	11,48	2313931,76

	Paracetamol + Ascorbic acid + Phenylephrine hydro	91589	14,24	1304227,36
	Paracetamol + Ibuprofen	13238	9,89	130923,82
	Paracetamol + Propyphenazone + Caffeine	25388	6,84	173653,92
	Paracetamol + Pseudoephedrine + Chlorphenamine	496146	8,19	4063435,74
	Paracetamol + Caffeine + Codeine	48438	12,71	615646,98
	Paracetamol + Ascorbic acid + Pheniramine maleate	62796	7,84	492320,64
	Paracetamol + Chlorphenamine	4216	7,88	33222,08
	Paracetamol + Vit V + Pheniramine	2204	7,84	17279,36
	Paracetamol + Acorbic acid + Caffeine + Chlorphenamine maleate	1227	6,21	7619,67
Antiviral	Aviron	523883	20,39	10681974,37
Microelements	Mg + Ca	35949	7,33	263506,17
	Zinc orotate dihydrate	110374	8,89	981224,86
Immunostimulants	Inosine acedoben dimepranol	55458	32,24	1787965,92
Corticosteroids	Dexamethasone	221150	15,01	3319461,5
Probiotics	Probiotic	7176	18,07	129670,32
Medical devices	Inhaller	464	100,98	46854,72
	Hand desinfectant	280010	4,99	1397249,9
	Plastic gloves	296288	25	7407200
	Spacer + Masks	17	47	799
	Mask for OPTICHAMBER DIAMOND	72547	18,88	1369687,36
	Termometers QUIKO EPA	153538	99,98	15350729,24
	Filters for inhaler	2	13,31	26,62



**Figure 1.** Cost of different preventive items

**Table 2.** Prescribed antibiotics

Therapeutic group	Product (INN)	Quantity	Price	Cost
Antibiotics	Amoxicillin	474882	5,4	2564362,8
	Ampicillin	2584	3,58	9250,72
	Azithromycin	190582	14,09	2685300,38
	Cefixime	170095	23,36	3973419,2
	Cefuroxime	367912	11,55	4249383,6
	Cefpodoxime proxetil	99792	24,09	2403989,28
	Cefprozil	71624	22,65	1622283,6
	Cefpodoxime	72500	22,65	1642125
	Ceftriaxone	42073	2,32	97609,36
	Levofloxacin	495720	11,36	5631379,2
Antibiotics combin	Ampicillin + Sulbactam	32653	13,5	440815,5
	Amoxicillin + Clavulanic acid	392069	24,63	9656659,47
	Ceftazidime and beta-lactamase inhibitor	1	12,08	12,08

**Table 3. Cost of vaccination**

Vaccine INN/Trade name	Price (BGN)	Number of applied doses	Total cost
COVID-19 mRNA Vaccine (nucleoside modified) (Commirnaty)	23,50	1 579 445	37 116 958
COVID-19 mRNA Vaccine (nucleoside modified) (Spikevax)	30,00	157 945	4 738 350
COVID-19 Vaccine (ChAdOx1-S [recombinant]) (Vaxzervia)	3,49	9025	31 497
COVID-19 vaccine (Ad26.COVS2-S [recombinant]) COVID-19 vaccine - Janssen	13,50	518 960	7 005 760

## DISCUSSION

To the best of our knowledge this is the first national study focusing on the cost of protection against COVID-19. It shows that the cost paid by the society for preventive medicines and medical devices is higher than that for vaccines. From all non prescription medicines and devices the cost for medical devices such as medical gloves, masks, inhalers is the largest one.

A study found that the average charge per COVID-19 patient requiring a hospital stay was \$73,300 [9]. Many studies reported the indirect cost from productivity losses due to quarantine, sick leaves or hospitalizations. The total life years lost in 2020, per person, from COVID-19 compared to the average annual cost of all other disasters from 2000-2019 is accounted for 0.041 in Americas to 0.016 in Africa [9]. In Bulgaria the indirect cost due to productivity losses was reported to be 3,14 billion BGN [10]. We did not find any other study exploring the cost of medical devices and other protective measures.

Prescribing antibiotics is controversial as a protective measure but we consider the fact that they were reported by the interviewed pharmacists as important, therefore, we decided to include them in our analysis. Pharmacists think that in time of mass hysteria people buy many unnecessary medicines and insist their physicians to prescribe such ones.

Our study has several limitations. The first one is that it is focused only on the outpatient practice and does not include the protective items paid by the hospitals for their personnel from the hospital budgets. We have to note that the real cost of the

vaccination is higher because we do not consider the labor time, equipment and facilities. It is also worth mentioning that there are doses which are supplied but still not applied to the people. According to information from the EU the total number of distributed doses to Bulgaria is 4 948 390 which is twice higher than the number of the applied ones.

Further studies need to be done to reveal the thorough cost of protection and its efficacy in terms of avoided infections.

## CONCLUSIONS

The COVID 19 pandemic is costly not only for the health insurance area as well as the government, yet for the people, too. People spent more for preventive goods including medical devices than the government spent for vaccines.

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