

Catastrophic out of pocket medicine expenditure: A case for monitoring performance of primary providers on national health insurance scheme

Paul Otor Onah^{1*}, Siyaka Abdulateef²

¹Department of clinical Pharmacy and Pharmacy administration, University of Maiduguri, Borno State, Nigeria

²Department of clinical Pharmacy and Pharmacy administration, University of Maiduguri, Borno State, Nigeria

ARTICLE INFO

Article history:

Received 22 July 2023
Revised 3 September 2023
Accepted 29 September 2023
Online 30 September 2023
Published

Keywords:

Essential medicines,
Health insurance,
Impoverishment,
Out of stock,
Stock outs

* Corresponding Author:

Email address: onahpaul@unimaid.edu.ng
+234 803 825 8589
<https://orcid.org/0000-0002-0551-1825>

ABSTRACT

Background: One of the critical components of national health insurance scheme is the financial protection it provides to patients by reducing out of pocket (OOP) healthcare expenditure. Among low income patients even a little OOP payments due to medicine unavailability of medicines can be financially catastrophic for households. The lack of medicines is not a new phenomenon, however it was expected that funding from health insurance will improve availability and significantly reduce or eliminate OOP for medicines. The effect of OOP medicines payments on impoverishment among insured patients remain largely unexplored in the country. This study therefore aim to determine OOP medicine payments and its impoverishing effect on patients living on national minimum wage.

Methods: This was a retrospective study using prescription records at the national health insurance pharmacy unit of the University of Maiduguri teaching hospital. A total of 2036 were selected by simple random method and reviewed for evidence of medicine unavailability (January 2022 – December 2022). Medicines for which “not available” (N/A) and “out of stock” (O/S) were indicated was considered to be unavailable at the time of filling the prescription. The cost for one month supply of drugs for non-communicable diseases (NCDs) and ten day supply for other drug classes was computed using average private and public sector prices for analysis. The data was analyzed using descriptive statistics and national minimum wage of N30,000/month (\$40) at the exchange rate of \$1 = N750.

Results: The profile of unavailable medicines indicated that all class of drug were affected (47 – 100%). The estimated OOP payments due to medicine stock out resulted in catastrophic expenditure of 12 – 232.5% of minimum wage and impoverishment rate of 12 – 132%. The protecting effect of health insurance was erased by the OOP payments leaving patients with impoverishment and inability to afford medicines.

Conclusion: There is need to regularly review of provider performance with respect to medicine availability, so as to protect the most vulnerable from catastrophic OOP medicine expenditure.

1. Introduction

In the last few decades, there have been increasing efforts to expand health insurance coverage in developing countries as a means of improving access and affordability of healthcare services. The efforts stemmed from the commitment of governments from low income countries to the implementation of universal health insurance coverage for all citizens as one of the sustainable development goals^{1,2}. The healthcare systems in most low income countries are still highly dominated by out of pocket payments for

medicines and other health services^{3,4}. In Nigeria, health insurance coverage remain relatively low despite the almost two decades old roll out of the scheme^{5,6}. The healthcare system is still bedeviled by a combination of low budgetary allocation, manpower deficit, poor service quality and low availability of essential medicines⁷. Consequently, OOP healthcare expenditure remain high accounting for over 70% of healthcare costs among households in Nigeria⁸. The consequence of this high level of OOP expenditure is delays in seeking medical care and in

some cases outright avoidance of the healthcare system when costs exceed the ability to pay⁹. A recent review of catastrophic OOP payments in 133 countries showed that its intensity is rising even among patients on health insurance¹⁰. The Nigeria's health insurance scheme was designed as a co-payment system where the patients contribute 10% of the cost of medicines and other healthcare services, while the balance is taken up by health maintenance organizations.

In a country with a high burden of both communicable and non-communicable diseases, OOP payments can be a significant source of economic distress^{11,12} and impoverishment^{13,14} to both insured and uninsured patients. In a recent systematic literature review of studies from low and middle income countries (LMICs) including Nigeria, catastrophic OOP payments of between 10 – 40% of household income have been reported to have imposed severe economic burden on patients¹⁵⁻¹⁷.

The financial burden can be made worse among patients with chronic diseases and multi-morbidities primarily due to their need for high level utilization of health services¹⁸. It is well established that medicines constitute the highest percentage of OOP payments, sometimes accounting for over 70% of total healthcare expenditure^{19,20}. Some studies reported that patients without health insurance suffering from chronic diseases have 2 – 7 times higher OOP payments compared to those with health insurance²⁰. Literature evidence have demonstrated negative effect of OOP payments on affordability of medicines²¹, treatment of infectious diseases²² and long term management of non-communicable disease^{23,24}. There is however paucity of data on medicine stock Out related OOP payments and its association with impoverishment among patients in the country^{25,26}.

Lack of essential medicines have been widely reported in both private and public health facilities in the country, although only a few studies have attributed the phenomenon to medicine stock outs as one of the reasons for OOP payments²⁷⁻²⁹. Global estimates of medicine availability ranged between 17 – 53% in both high- and low-income countries although to varying degrees of intensity^{30,31}. The health insurance system was established as a sustainable healthcare financing system and it's expected to be able to comprehensively address medicine shortages and/or stock outs. The finances available to primary healthcare providers is expected to be deployed to provide quality healthcare services and medicines needed by patients. The extent to which these objectives have been met has not received much critical appraisal since the

launch of the national health insurance scheme almost two decades ago.

In spite of increasing emphasis on national health insurance scheme as a viable financing system for promoting access to quality assured medicines, stock outs remain endemic in the healthcare system of many developing countries³²⁻³⁴. The stock out of medicines is reported to affect all classes of medicines including antibiotics³⁵⁻³⁷, antidiabetics^{38,39} and narcotic analgesics^(40,41) even among insured patients^(36,37). While the rate of stock outs vary highly within and between healthcare systems, estimates of 6 – 31% have been frequently reported in studies^(42,43). The challenge of OOP medicine expenditure in health facilities operated by primary providers under the national health insurance scheme has received little research attention, so the major aim of this study is to assess OOP medicine expenditure and explore its impoverishing effects on patients.

2. Methods

2.1. Study Setting: The University of Maiduguri teaching hospital located in Maiduguri, capital Borno State, North east Nigeria (11° 49' 28 " N and 13° 11' 11" E) was commissioned in 1983 as a federal government owned tertiary health facility and has since grown into a 500 bed hospital with seventeen clinical and non-clinical departments. The facility has served as a referral hospital for the over 25 million people in the North east region of Nigeria including neighbouring countries like Chad, Niger and Cameroon. The study was carried out in the pharmacy unit that exclusively provide pharmaceutical services to enrollees under the health insurance scheme.

2.2. Study design and sample size/sampling. This was a cross sectional retrospective study of medicine stock outs and associated OOP expenditure using prescription records from health insurance pharmacy unit. Sample size was calculated using fishers method at 96% confidence level, Z = 1.96 and 5% margin of error. A total of 3578 prescriptions within the study period were reviewed out of which 2036 (56.9%) prescriptions had one or more stock outs. Prescriptions that had stock outs for one morbidity were 1342 (65.9%), while 694 (34.1%) prescriptions contain more than one drug for non-communicable (NCD) diseases. The prescriptions reviewed covered the period between October 2021 and October 2022.

2.3 Outcome Indicators: Medicine stock out was determined when “not available” (N/A) or out of stock

(O/S) signs were found written against drugs not dispensed at the health insurance pharmacy unit. These indicators are generally used in medicine dispensing process, stock management and record keeping system in the hospital as signs of stock outs. In addition, OOP medicine payment was assumed for all drugs that were out of stock for which costs was calculated from hospital and community pharmacy prices. The OOP expenditure was calculated for one month supply of drugs used for NCDs while a ten day supply for other drugs using dosage and drug combinations as prescribed. The current poverty line of the Nigeria (\$1.9/day) and \$1.3/day national minimum wage were used as benchmark for assessing impoverishing effect ($I = N750$). It was assumed that medicines that were unavailable were purchased from community pharmacies and only generic brands were involved.

2.4. Data Collection: Data extracted from prescriptions included basic demographic information, drugs, strength, dosage, duration of therapy and other relevant data was extracted for analysis. The price of generic versions was obtained from the hospital and community pharmacies and average price used for analysis

2.5. Analysis: The cost of medicines was determined by averaging hospital and community pharmacy prices and estimated cost of one month supply was calculated in the case of drugs for NCDs, and ten day cost for other class of prescribed drugs. The cost estimate was based on patient prescriptions and on prevailing price of drugs at the time of data collection. The calculated OOP expenditure was compared with monthly wage of patients on national minimum wage (\$1.3/day) to assess impoverishing effect.

2.6. Ethical Issues: Ethical approval was obtained from health research ethics committee of the University of Maiduguri teaching hospital before commencement of the study.

3. Results

3.1. Demographic characteristics of patients

The result showed that more than half of prescriptions reviewed were for females (54%) compared to males (46%). There were 2-8 drugs per prescription of which 1 – 2 of them experienced stock out at the time of dispensing (Table 1).

Table 1: Demographic data

Demographic data	
Gender	
Male	937 (46%)
Female	1099 (54%)
Age (yrs.)	54.7 ± 14.8
Number of drugs/prescription	5.3 ± 3.4
Stock outs/prescription	3.5 ± 2.3

3.2. Stock outs of medicines for NCDs

Medicine stock out profile showed that between 48 – 97% of drugs were unavailable at any one point within the study period. A further breakdown showed drugs for heart disorders (97.2%), anticonvulsants (88.1%), cardiovascular drugs (51.9%), antilipidaemics (48.2%) and antidiabetics (44.2%) frequently experienced stock outs (Table 2).

Table 2: Prevalence of stock outs for NCD medicines (I)

Class of drug	Stock out (%)
Cardiovascular drugs	
Amlodipine 10mg (<i>n</i> =473)	190 (40.2)
Atenolol 50mg (<i>n</i> =127)	80 (62.9)
Captopril 50mg (<i>n</i> =108)	65 (52.4)
Carvedilol 6.25mg (<i>n</i> =124)	108 (75.9)
Lisinopril 10mg (<i>n</i> =432)	52 (12)
Losartan 50mg (<i>n</i> =382)	365 (95.5)
Methyldopa 250mg (<i>n</i> =31)	9 (29)
Nifedipine 20mg (<i>n</i> =152)	91 (59.9)
Telmisartan 40mg (<i>n</i> =35)	35 (100)
Subtotal = (<i>n</i>=1864)	969 (51.9)
Heart disorders	
Digoxin 0.25mcg (<i>n</i> =18)	16 (88.9)
Isosorbide dinitrate 2.5mg (<i>n</i> =53)	53 (100)
Subtotal = (<i>n</i>=71)	69 (97.2)
Antidiabetics	
Glibenclamide 5mg (<i>n</i> =20)	7 (35)
Glimepiride 2mg (<i>n</i> =214)	152 (71)
Gliclazide(<i>n</i> =88)	43 (48.9)
Insulin (Soluble) 40IU (<i>n</i> =103)	60 (58.2)

Metformin 500mg (<i>n</i> =369)	60 (16.3)
Metformin + Glimepiride 500/2mg (<i>n</i> =24)	24 (66.7)
Metformin + Vildagliptin 500/50mg (<i>n</i> =11)	6 (54.5)
Vildagliptin 50mg (<i>n</i> =41)	41 (100)
Subtotal = (<i>n</i>=870)	385 (44.2)
Anticonvulsants	
Biopentin 300mg (<i>n</i> =54)	49 (90.7)
Carbamazepine 400mg (<i>n</i> =70)	46 (65.7)
Gabapentin 300mg (<i>n</i> =28)	28 (100)
Pregabalin 75mg (<i>n</i> =91)	91 (100)
Subtotal = (<i>n</i>=243)	214 (88.1)
Antilipidaemics	
Atorvastatin 10mg (<i>n</i> =260)	186 (71.5)
Rosuvastatin 10mg (<i>n</i> =221)	56 (25.3)
Simvastatin 40mg (<i>n</i> =98)	37 (48.2)
Subtotal = (<i>n</i>=579)	279 (48.2)

3.3. Stock out of medicines for NCDs

The most unavailable drugs included uricosurics, anticoagulants, antiarthritics and drug for benign prostate hyperplasia (100%), while Erythropoietin (71.4%) and antiasthmatics (47.4%) also experienced significant stock out (Table 3).

Table 3: Prevalence of stock outs for NCDs (II)

Class of drug	Stock out (%)
Uricosurics	
Allopurinol 300mg (<i>n</i> =151)	151 (100)
Febuxostat 40mg (<i>n</i> =45)	45 (100)
Subtotal = (<i>n</i>=196)	196 (100)
Anticoagulants	
Warfarin 20mg (<i>n</i> =46)	46 (100)
Clexane 40mg (<i>n</i> =24)	24 (100)
Subtotal = (<i>n</i>=70)	70 (100)
Antiasthmatics	
Salbutamol 2mg (<i>n</i> =268)	79 (29.5)
Salbutamol inhaler (<i>n</i> =107)	69 (64.5)
Salmeterol + Flucotisona (<i>n</i> =57)	57 (100)
Subtotal = (<i>n</i>=432)	205 (47.4)
Antithyroids	
Carbimazole 10mg (<i>n</i> =118)	85 (72)

BPH drugs (<i>n</i>=36)	
Tamulosin 0.4mg (<i>n</i> =36)	36 (100)
Antiarthritics	
Celecoxib 50mg (<i>n</i> =19)	19 (100)
Celebrex 200mg (<i>n</i> =22)	22 (100)
Colchicine 0.5mg (<i>n</i> =49)	49 (100)
Subtotal = (<i>N</i>=90)	90 (100)
Hormones (<i>n</i>=35)	
Erythropoietin 2000units (<i>n</i> =35)	25 (71.4)

3.4. Stock out of antineoplastics and narcotic analgesics

The stock out of antineoplastics was very high (73.6%) although lower than that with narcotic analgesics (95.1%) (Table 4).

Table 4: Prevalence of anticancer and opiate stock outs

Name of drugs	Stock out (%)
Antineoplastics	
Actinomycin D 500mcg (<i>n</i> =15)	12 (80)
Cyclophosphamide 500mg (<i>n</i> =50)	36 (72)
Doxorubicin 50mg (<i>n</i> =40)	30 (75)
5 – Fluorouracil 500mg (<i>n</i> =25)	21 (84)
Hydroxyurea 500mg (<i>n</i> =11)	9 (81.8)
Methotrexate 2.5mg (<i>n</i> =61)	42 (68.8)
Tamoxifen 20mg (<i>n</i> =88)	81 (92)
Vincristine 1mg (<i>n</i> =47)	17 (36.2)
Subtotal = (<i>n</i>=337)	248 (73.6)
Narcotic analgesics	
Dihydrocodeine 30mg (<i>n</i> =59)	59 (100)
Codeine + Paracetamol (<i>n</i> =284)	278 (97.9)
Pentazocine 30mg (<i>n</i> =145)	131 (90.3)
Tramadol 50mg (<i>n</i> =46)	40 (86.9)
Subtotal = (<i>n</i>=534)	508 (95.1)

3.5. Stock out of antibiotics and antiulcers

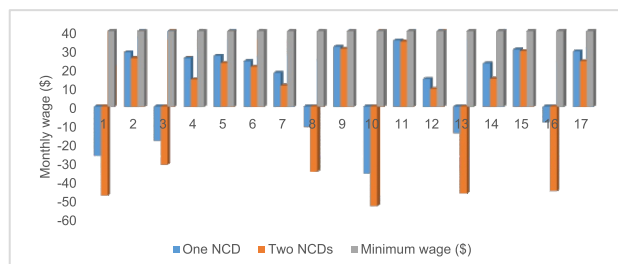
Antibiotics which were the second most frequently prescribed class of drugs had an overall stock out rate of (71%) followed by antiulcers (61.5%), while muscle relaxants were completely unavailable (100%) within the study period (Table 5).

Table 5: Prevalence of medicine stock outs (IV)

Name of drug	Stock out (%)
Antibiotics	
Amoxicillin + Clavulanic acid 625mg (n=401)	310 (75.9)
Azithromycin 250mg (n=22)	14 (63.6)
Ceftriaxone 1g (n=282)	282 (68.4)
Ceftazidime 1g (n=144)	108 (75)
Cefuroxime 500mg (n=31)	15 (48.4)
Cefixime 200mg (n=18)	2 (6.4)
Ciprofloxacin 500mg (n=60)	36 (60)
Clarithromycin 500mg (n=25)	19 (76)
Clindamycin 500mg (n=41)	32 (78)
Erythromycin 500mg (n=21)	12 (57.1)
Gentamycin 80mg (n=34)	25 (73.5)
Levofloxacin 500mg (n=23)	16 (69.6)
Ofloxacin 200mg (n=19)	19 (100)
Subtotal = 1128	801 (71)
Antiulcers	
Omeprazole IV 40mg (n=36)	36 (100)
Rabeprazole IV 20mg (n=7)	7 (100)
Ranitidine IV 50mg (n=24)	24 (100)
Omeprazole 20mg (n=94)	27 (28.7)
Rabeprazole 20mg (n=151)	98 (64.9)
Subtotal = 312	192 (61.5)
Muscle relaxants	
Baclofen 20mg (n=45)	45 (100)
Tizanidine 2mg (n=24)	24(100)
Ophenadrine 100mg (n=20)	20(100)
Subtotal = 89	89(100)

3.6. Effect of wage decline after OOP payment

There was significant decline in monthly wages as a result of OOP medicine expenditure. So stock out induced OOP expenditure took \$8 – 35 more than the minimum wage to obtain medicines for NCDs (antidiabetics, anticonvulsants, hormones, antineoplastics and narcotic analgesics) as well as a ten day course of therapy of antibiotics. Among patients with two NCDs \$30.6 – 53 is required to pay for OOP medicine expenditure as shown in Figure 1.



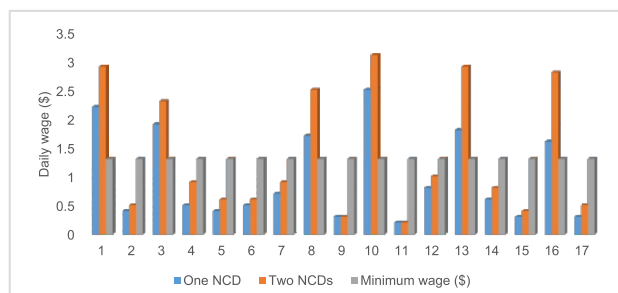
Key: Minimum wage = \$40/month (\$1.3/day), \$1 = N750

Figure 1: Wage after OOP medicine expenditure

Key: 1 = antidiabetics, 2 = antilipidaemics, 3 = anticonvulsants, 4 = anticoagulants, 5 = antiasthmatics, 6 = Antithyroids, 7 = antiarthritics, 8 = antineoplastics, 9 = antibiotics, 10 = antiulcers, 11 = Benign prostate hyperplasia (BPH) drug, 12 = Cardiovascular drugs, 13 = hormones, 14 = heart diseases, 15 = muscle relaxants, 16 = narcotic analgesics, 17 = uricosurics

3.7. Comparison of OOP expenditure and minimum wage

A comparison of OOP medicine expenditure on antidiabetics, anticonvulsants, antineoplastics, narcotic analgesics and antibiotics cost patients with one NCD \$1.6 – 2.5/day and \$2.3 – 3.1/day for those with two NCDs. The other drugs took away significant portion of the income (\$0.2 – 0.8/day) (15.4 – 61.5%) for patients with one NCD and \$0.2 – 3.1/day (15.4 – 275.4%) for those with two NCDs (Figure 2).



Key: Minimum wage = \$40/month (\$1.3/day), \$1 = N750

Figure 2: OOP medicine expenditure compared to minimum wage

3.8. Comparison of copayment (10%) and OOP payments

It is clear from the results that if medicines were available co-payment will drastically reduce OOP medicine expenditure drastically reduced OOP payments to 1.3 – 19.1% of medicine costs compared to 13 – 210% percent of minimum wage which have the same effect as with the uninsured (Figure 3).

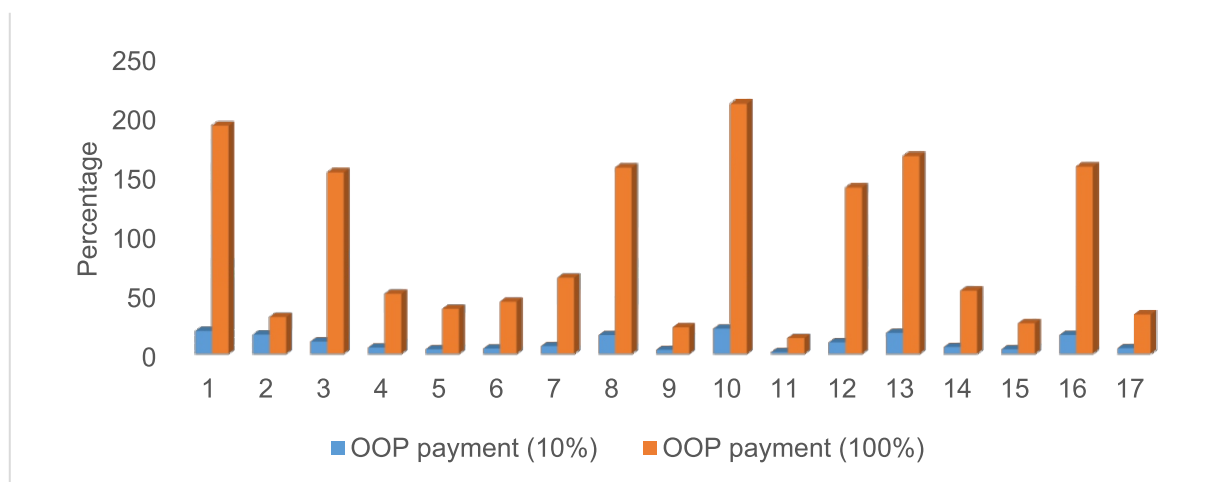


Figure 3: Comparison of co-payment and OOP medicine expenditure

3.9. Estimation of catastrophic payment based on monthly minimum wage

The income loss after OOP medicine expenditure was 12.2 – 188% for patients with one NCD and 14 – 232.5% for those with two NCDs based on the current minimum wage. This represented catastrophic expenditure of more than 10 -40% threshold of income (**Figure 4**).

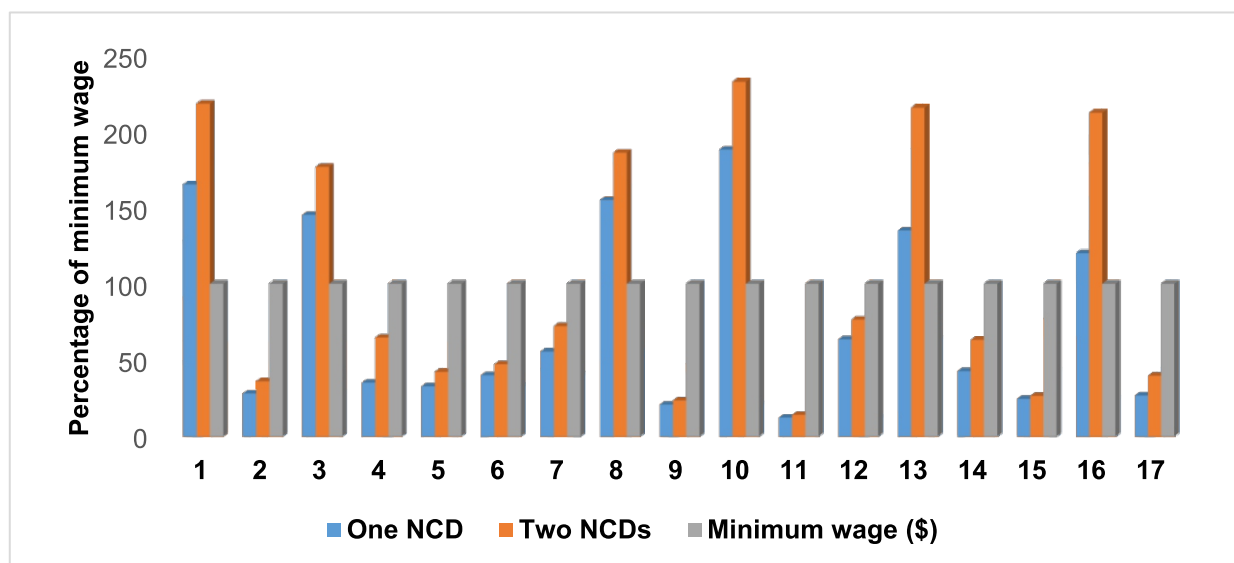


Figure 4: Catastrophic OOP payments versus minimum wage (\$40/month)

3.10. Impoverishing effect of OOP payments

This result showed impoverishment of 20 – 88% and 112.2 – 132.5% among patients with one and two chronic diseases respectively. The OOP payment for other class of drugs represented impoverishment of between 12.2 – 63.5% and 14 – 76.5% among patients with one and two morbidities respectively (**Figure 5**).

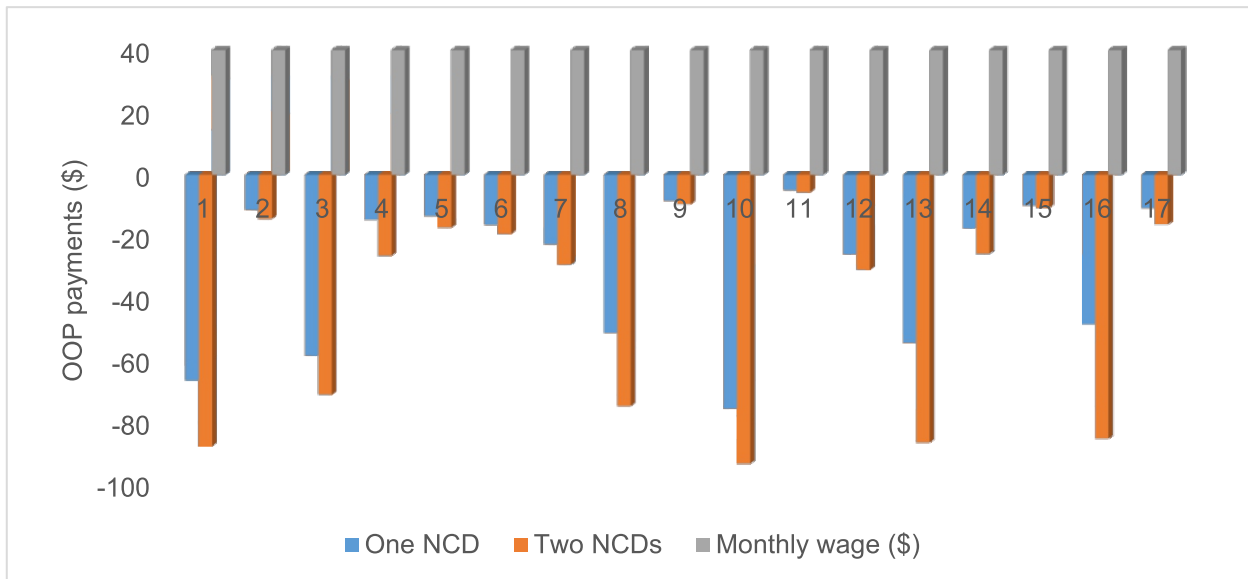


Figure 5: Impoverishing effect of OOP medicine expenditure

4. Discussion

The national health insurance scheme was designed not only to improve access to healthcare, but also to be a financial cushion against the increasing cost of medicines and other healthcare services. In the years that followed its launch, evidence suggest that it reduced OOP on medicines⁴⁴⁻⁴⁶, increased healthcare utilization^{47,48} and enabled freedom of patients to choose healthcare providers^{49,50}. While there have been some contrasting results with respect to the impact of health insurance on overall Reduction in OOP expenditure⁵¹, particularly among the low income earners⁵², the findings of this study point to worsening OOP payments. The prevalence and intensity of OOP medicine expenditure vary widely between drugs similar to the findings of this study^{3,53}, there is however scanty literature on stock out induced OOP expenditure among patients on health insurance.

The level of medicine stock outs in this study was considerably higher than previously reported in recent studies^{42,43}. The OOP expenditure observed in this study is comparatively higher for chronic diseases compared to other diseases, and also higher compared to the national minimum wage. The implication of this is that many patients living on low wages will be left with little or nothing after OOP medicine expenditure. As OOP payments rise there is a corresponding decrease in real wage which clearly indicate worsening impoverishment among patients. In a country where low cadre workers earn

less than the poverty line of \$1.9/day, OOP medicine expenditure induced by stock out practically remove the financial cushion that health insurance was intended to provide to these most vulnerable group of patients.

The widespread stock outs dramatically increase the cost of medicines as patients increasingly purchase their medicines from community pharmacies^{54,55} like previous studies^{9,56,57}. There was a comparable finding from a similar study which examined OOP payments between insured and uninsured patients⁵⁸, although some studies concluded that its worse for NCD drugs^{59,60}. The availability of medicines is one of the critical cornerstones of health insurance scheme^{61,62}, so stock outs represent a serious underperformance of health insurance management system in the facility¹¹.

While several studies from developing countries have reported effects of OOP healthcare payments on impoverishment, they did not isolate the contribution of medicines stock outs in the overall estimation of healthcare expenditures^{63,64}. Medicines are known to account for up to 74% of OOP healthcare expenditure, so stock outs can significantly contribute to poverty among the poor and most vulnerable patients^{13,65}. The impoverishing effect of OOP medicine payments observed in this study was twice as intense for NCD medicines^{3,9,52} compared to other class of drugs^{56,66}. It is therefore important that attention be paid to medicine availability at primary provider facilities to limit the financial impact of OOP on patients, if the objectives of national health insurance scheme is to be achieved in the

country

Limitations: The data was obtained from prescription records and may include errors in tagging unavailable medicines, or may have been eventually dispensed after supplies were obtained. The price of generic brands was used for all calculations and so did not take into account patients who were prescribed or purchased innovator brands. The calculated costs of medicines was based on actual prescriptions and for one month supply in the case of chronic diseases and ten days for other diseases, and changes to patient medications was not considered. The OOP payments was calculated based on the prevailing prices of medicines and may be subject to sudden changes. The study focused specifically on low income patients living on minimum wage, so results may be different for higher income groups.

5. Conclusion

Medicine stock out and associated OOP payments is a major source of catastrophic expenditure and impoverishment among patients. There should be periodic review of medicine availability, because stock outs is not only a sign of service quality underperformance, but also deprive patients of financial protection expected from health insurance.

Conflict of interest: The authors declare no conflict of interest.

Author's contributions: POO: concept, data collection, literature review, data analysis, manuscript draft SA: Data collection, data analysis, review of draft manuscript. Authors have read and approved the final version of the manuscript.

References

1. World Health Organization WHO Health systems financing: the path to universal coverage. Geneva: World Health Organization; 2012 <https://apps.who.int/iris/handle/10665/44371>. Accessed on 13th July 2023
2. United Nations. Sustainable development goals: 17 goals to transform our world. 2015. <http://www.un.org/sustainabledevelopment/>. Accessed on 13th July 2023
3. Barasa EW, Maina T, Ravishankar N (2017) Assessing the impoverishing effects, and factors associated with the incidence of catastrophic health care payments in Kenya. *International Journal for Equity in Health*. 16:31

<https://doi.org/10.1186/s12939-017-0526-x>

4. Adesina AD and Ogaji DS (2018) Impoverishing effect of household healthcare expenditure in semi-rural communities in Yenagoa, Nigeria. *Healthcare in Low-resource Settings* 6: 7464 <https://doi.org/10.4081/hls.2018.7464>
5. World Health Organization's Report. Health system financing: the path to universal coverage. 2010. <https://apps.who.int/iris/handle/10665/44371>. Accessed on 5th July 2023
6. Onoka CA, Onwujekwe OE, Uzochukwu BS, Ezumah NN (2013) Promoting universal financial protection: constraints and enabling factors in scaling-up coverage with social health insurance in Nigeria. *Health Research and Policy System* 11:20 <https://doi.org/10.1186/1478-4505-11-20>
7. World Bank, 2016. World Development Indicator (WDI) 2016 <http://databank.worldbank.org> Accessed on 12th July 2023
8. Hafez R (2018) Nigeria health financing system assessment. Discussion Paper, World Bank. <https://doi.org/10.1596/30174>
9. World Health Organization. Public financing for health in Africa: from Abuja to the SDGs. Geneva: *World Health Organization*; 2016. [WHO/HIS/HGF/Tech.Report/16.2](https://www.who.int/publications/i/item/WHO-HIS-HGF-Tech-Report-16.2) Accessed on 10th July 2023
10. Sayuti M and Sukeri S (2022) Assessing progress towards sustainable development goal 3.8.2 and determinants of catastrophic health expenditures in Malaysia. *Plos One* 17(2): e0264422 <https://doi.org/10.1371/journal.pone.0264422>
11. Sum G, Hone T and Lee JT (2018) Multimorbidity and out-of-pocket expenditure on medicines: a systematic review. *BMJ Global Health* 3:e000505 <https://doi.org/10.1136/bmjgh-2017-000505>
12. Kankeu HT, Saksena P, Xu K, Evans DB (2013) The financial burden from non-communicable diseases in low- and middle-income countries: a literature review. *Health Research and Policy System* 11: 31 <https://doi.org/10.1186/1478-4505-11-31>
13. Wagstaff A, Flores G and Eozenou P (2018) Progress on catastrophic health spending in 133 countries: a retrospective observational study. *The Lancet Global Health* 6: e169–79 [https://doi.org/10.1016/S2214-109X\(17\)30429-1](https://doi.org/10.1016/S2214-109X(17)30429-1)
14. Hailemichael Y, Hanlon C and Hailemariam D (2019) Catastrophic health expenditure and impoverishment in households of persons with depression:

- a cross-sectional, comparative study in rural Ethiopia. *BMC Public Health* 19: 930 <https://doi.org/10.1186/s12889-019-7239-6>
15. Jan S, Lee SW and [Huo Y](#) (2016) Catastrophic health expenditure on acute coronary events in Asia: a prospective study. *Bulletin of the World Health Organization* 94: 193 <https://doi.org/10.2471/BLT.15.158303>
16. Okoronkwo IL, Ekpemiro JN, Okwor EU, Okpala PU, Adeyemo FO (2015) Economic burden and catastrophic cost among people living with type2 diabetes mellitus attending a tertiary health institution in south-east zone, Nigeria. *BMC Research Notes* 8: 527 <https://doi.org/10.1186/s13104-015-1489-x>
17. Salari P, Di Giorgio L, Ilinca S, Chuma J (2019) The catastrophic and impoverishing effects of out-of-pocket healthcare payments in Kenya. *BMJ Global Health* 4:e001809 <https://doi.org/10.1136/bmjgh-2019-001809>
18. Jaspers L, Colpani V and [Franco OH](#) (2015) The global impact of non-communicable diseases on households and impoverishment: a systematic review. *European Journal of Epidemiology* 30:163–88 <https://doi.org/10.1007/s10654-014-9983-3>
19. Lee JT, Hamid F and [Millett C](#) (2015) Impact of non-communicable disease multi-morbidity on healthcare utilization and out-of-pocket expenditures in middle-income countries: cross sectional analysis. *Plos One* 10:e0127199 <https://doi.org/10.1371/journal.pone.0127199>
20. Jan S, Laba T-L and Atun R (2018) The Lancet Taskforce on NCDs and economics 3 Action to address the household economic burden of non-communicable diseases. *Lancet* 391: 2047–2058 [https://doi.org/10.1016/S0140-6736\(18\)30323-4](https://doi.org/10.1016/S0140-6736(18)30323-4)
21. Kiil A and Houlberg K (2014) How does copayment for health care services affect demand, health and redistribution? A systematic review of the empirical evidence from 1990 to 2011. *European Journal of Health Economics* HEPAC 15: 813 <https://doi.org/10.1007/s10198-013-0526-8>
22. Negin J, Randell M and Kowal P (2016) Health expenditure and catastrophic spending among older adults living with HIV. *Global Public Health* 12: 1–15 <https://doi.org/10.1080/17441692.2016.1173717>
23. Azzani M, Roslani AC, Su TT (2015) The perceived cancer-related financial hardship among patients and their families: A systematic review. *Support Care Cancer* 23: 889–898 <https://doi.org/10.1007/s00520-014-2474-y>
24. Xin XX, Guan XD, Shi LW (2016) Catastrophic expenditure and impoverishment of patients affected by 7 rare diseases in China. *Orphanet Journal of Rare Diseases* 11: 74 <https://doi.org/10.1186/s13023-016-0454-7>
25. van Doorslaer E, O'Donnell O and [Zhao Y](#) (2007) Catastrophic payments for health care in Asia. *Health Economics* 16: 1159–1184 <https://doi.org/10.1002/hec.1209>
26. Hadley J (2007) Insurance coverage, medical care use, and short-term health changes following an unintentional injury or the onset of a chronic condition. *Journal of American Medical Association* 297: 1073–1084 <https://doi.org/10.1001/jama.297.10.1073>
27. Fatima SA and Khaliq A (2017). A survey regarding drug shortage in tertiary care hospitals of Karachi, Pakistan. *Journal of Pharmacy Practice and Community Medicine* 3(4): 262–266 <http://dx.doi.org/10.5530/jppcm.2017.4.69>
28. Martei YM, Grover S and DeMichele A (2019). Impact of essential medicine stock outs on cancer therapy delivery in a resource-limited setting. *Journal of Global Oncology* 5: 1–11 <https://doi.org/10.1200/JGO.18.00230>
29. Mukundiyukuri JP, Irakiza JJ and Hedt-Gauthier B (2020) Availability, costs and stock-outs of essential NCD drugs in three rural Rwandan districts. *Annals of Global Health*. 86(1): 123 <https://doi.org/10.5334/aogh.2729>
30. Hordes R, Price I and Cluver L (2017) How front-line healthcare workers respond to stock-outs of essential medicines in the Eastern Cape province of South Africa. *South African Medical Journal* 107(9): 738-740 <https://doi.org/10.7196/SAMJ.2017.v107i9.12476>
31. Ndzamela S and Burton S (2020) Patients and healthcare professionals' experiences of medicine stock-outs and shortages at a community healthcare centre in the Eastern Cape. *South African Pharmaceutical Journal* 87(5): 37i-37m
32. Wagenaar BH, Gimbel S and Sherr K (2014) Stock-outs of essential health products in Mozambique - longitudinal analyses from 2011 to 2013. *Tropical Medicine and International Health* 19(7):791–801
33. Osuafor NG, Ukwe CV, Okonta M (2021) Evaluation of availability, price, and affordability of cardiovascular, diabetes, and global medicines in Abuja, Nigeria. *Plos One* 16(8): e0255567 <https://doi.org/10.1111/tmi.12314>
- [Ozoh](#)
34. OB, [Eze JN](#) and [Beran D](#) (2021) Nationwide survey of the availability and affordability of asthma and COPD medicines in Nigeria. *Tropical Medicine and International Health* 26(1): 54 -65 <https://doi.org/10.1111/tmi.12314>

[10.1111/tmi.13497](https://doi.org/10.1111/tmi.13497)

35. Hawley KL, Mazer-Amirshahi M and Pines JM (2016) Longitudinal trends in U.S. shortages for medications used in emergency departments [2001–2014]. *Academic Journal of Emerging Medicine* 23(1): 63–69 <https://doi.org/10.1111/acem.12838>

36. Pulcini C, Beovic B and Sharland M (2017) Ensuring universal access to old antibiotics: a critical but neglected priority. *Clinical Microbiology and Infection* 23(9): 590–592 <https://doi.org/10.1016/j.cmi.2017.04.026>

37. Nurse-Findlay S, Taylor MM and Pyne-Mercier L (2017) Shortages of Benzathine Penicillin for prevention of mother-to-child transmission of syphilis: An evaluation from multi-country surveys and stakeholder interviews. *Plos Medicine* 14(12): e1002473 <https://doi.org/10.1371/journal.pmed.1002473>

Sun

38. J, Hu CJ and Liu Y (2018) A review of promoting access to medicines in China - problems and recommendations. *BMC Health Services Research* 18: 125 <https://doi.org/10.1186/s12913-018-2875-6>

39. Gong S, Cai H and Jin S (2018) The availability, price and affordability of antidiabetic drugs in Hubei province, China. *Health Policy Planning* 33: 937–947 <https://doi.org/10.1093/heapol/czy076>

40. Nchakoa E, Bussella S, Nesbeth C, Odoh C (2018) Barriers to the availability and accessibility of controlled medicines for chronic pain in Africa. *International Health* 10(2): 71–77. <https://doi.org/10.1093/inthealth/ihy002>

41. Knaul FM, Farmer PE and Rajagopa MR (2018) Alleviating the access abyss in palliative care and pain relief—an imperative of universal health coverage: the Lancet Commission report. *Lancet* 391(10128): 1391–1454 [https://doi.org/10.1016/S0140-6736\(17\)32513-8](https://doi.org/10.1016/S0140-6736(17)32513-8)

42. Ashigbie PG, Rockers PC, Laing RO, Cabral HJ, Onyango MA, Likalamu JP, Wirtz VJ (2020) Availability and prices of medicines for non-communicable diseases at health facilities and retail drug outlets in Kenya: a cross-sectional survey in eight counties. *BMJ Open* 10:e035132 <http://dx.doi.org/10.1136/bmjopen-2019-035132>

43. Acosta A, Vanegas EP, Rovira J, Godman B and Bochenek T (2019) Medicine shortages: Gaps between countries and global perspectives. *Frontiers Pharmacology* 10: 763 <https://doi.org/10.3389/fphar.2019.00763>

44. Al-Hanawi MK, Mwale ML and Qattan AMN (2021) Health insurance and out-of-pocket expenditure on

health and medicine: heterogeneities along income. *Frontiers Pharmacology* 2: 638035 <https://doi.org/10.3389/fphar.2021.638035>

45. Tirgil A, Dickens WT, Atun R (2019) Effects of expanding a non-contributory health insurance scheme on out-of-pocket healthcare spending by the poor in Turkey. *B M J Global Health* 4: e001540. <http://dx.doi.org/10.1136/bmjgh-2019-001540>

46. Wirtz VJ, Servan-Mori E and Laing R (2022) Probability and amount of medicines expenditure according to health insurance status in Kenya: A household survey in eight counties. *International Journal of Health Planning and Management* 37(2): 725–733 <https://doi.org/10.1002/hpm.3368>

47. Acharya A, Vellakkal S and Ebrahim S Impact of national health insurance for the poor and the informal sector in low- and middle-income countries: a systematic review. London: EPPI-Centre, Social Science Research Unit, Institute of Education, University of London; 2012 <http://eppi.ioe.ac.uk/cms/Default.aspx?tabid=3346> Accessed 14th July 2023

48. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. (2015) Health Insurance for India's poor: Meeting the challenge with information technology. A publication in the German Health Practice Collection 2015

www.health.bmz.de/good-practices/GHPC/Health_Insurance_India_New/RSBY_EN_long-Oct-2011.pdf Accessed 9th July 2023

49. Ghosh S (2014) Equity in the utilization of healthcare services in India: evidence from national sample survey. *International Journal of Health Policy Management* 2(1): 29–38 <https://doi.org/10.15171/ijhpm.2014.06>

50. Jain N, Kumar A, Nandraj S, Furtado KM (2015) NSSO 71st round same data, multiple interpretations. *Economic and Political Weekly* 50 (46 & 47): 84–87 <https://www.jstor.org/stable/44002870>

51. Sundararaman T, Muraleedharan VR, Mukhopadhyay I (2016) NSSO 71st round data on health and beyond questioning frameworks of analysis. *Economic and Political Weekly* 51 (3): 85–88 <https://www.jstor.org/stable/44004209>

52. Aregbeshola BS and Khan SM (2018) Out-of-pocket payments, catastrophic health expenditure and poverty among households in Nigeria 2010. *International Journal of Health Policy Management* 7(9): 798–806 <https://doi.org/10.15171/ijhpm.2018.19>

53. Edeh HC (2022) Exploring dynamics in

- catastrophic health care expenditure in Nigeria. *Health Economics Review* 12: 22 <https://doi.org/10.1186/s13561-022-00366-y>
54. Beogo I, Huang N, Gagnon MP, Amendah DD (2016) Out of pocket expenditure and its determinants in the context of private healthcare sector expansion in sub-Saharan Africa urban cities: evidence from household survey in Ouagadougou, Burkina Faso. *BMC Research Notes* 9: 1–10 <https://doi.org/10.1186/s13104-016-1846-4>
55. Cherny NI, Sullivan R and Eniu A (2017) ESMO International consortium study on the availability, out-of-pocket costs and accessibility of antineoplastic medicines in countries outside of Europe. *Annals of Oncology* 28(11):2633–2647 <https://doi.org/10.1093/annonc/mdx521>
56. Mekuria GA and Ali EE (2023) The financial burden of out of pocket payments on medicines among households in Ethiopia: analysis of trends and contributing factors. *BMC Public Health* 23: 808 <https://doi.org/10.1186/s12889-023-15751-3>
57. Selvaraj S, Farooqui HH, Karan A (2018) Quantifying the financial burden of households' out-of-pocket payments on medicines in India: a repeated cross-sectional analysis of national sample survey data, 1994–2014. *BMJ Open* 8(5): 1–10 <https://doi.org/10.1136/bmjopen-2017-018020>
58. Kuwawenaruwa A, Wyss K and Tediosi F (2020) The effects of medicines availability and stock-outs on household's utilization of healthcare services in Dodoma region, Tanzania. *Health Policy Planning* 35(5): 323–333 <https://doi.org/10.1093/heapol/czz173>
59. Gabrani J, Schindler C, Wyss K (2022) Out of pocket payments and access to NCD medication in two regions in Albania. *Plos One* 17(8): e0272221 <https://doi.org/10.1371/journal.pone.0272221>
60. WHO (2018) New perspectives on global health spending for universal health coverage. World Health Organization http://www.who.int/health_financing/topics/resource-tracking/new-perspectives/en/. Accessed 8th July 2023
61. Prinja S, Bahuguna P, Tripathy JP, Kumar R (2015) Availability of medicines in public sector health facilities of two North Indian States. *BMC Pharmacology and Toxicology* 16: 43 <https://doi.org/10.1186/s40360-015-0043-8>
62. Bigdeli M, Laing R, Tomson G, Babar ZU (2015) Medicines and universal health coverage: challenges and opportunities. *Journal of Pharmaceutical Policy and Practice* 8: 8 <https://doi.org/10.1186/s40545-015-0028-4>
63. Dorjdagva J, Batbaatar E and Kauhanen J (2016) Catastrophic health expenditure and impoverishment in Mongolia. *International Journal of Equity in Health*. 15(1):105 <https://doi.org/10.1186/s12939-016-0395-8>
64. Ichoku HE, Fonta WM, Onwujekwe O (2009) Incidence and intensity of catastrophic health care financing and impoverishment due to out-of-pocket payments in southeast Nigeria. *Journal of Insurance and Risk Management* 4(4): 47-59
65. Wang H, Torres LV, Travis P (2018) Financial protection analysis in eight countries in the WHO South-East Asia Region. *Bulletin of World Health Organization* 96(9): 610–620E <https://doi.org/10.2471/BLT.18.209858>
66. McHenga M, Chirwa GC, Chiwaula LS (2017) Impoverishing effects of catastrophic health expenditures in Malawi. *International Journal of Equity in Health* 16: 25 <https://doi.org/10.1186/s12939-017-0515-0>