

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

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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

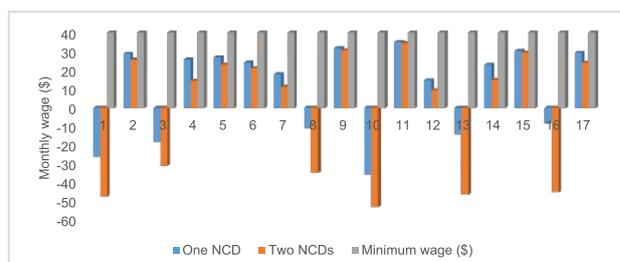
Antibiotics which were the second most frequently prescribed class of drugs had an overall stock out rate of (71%) followed by antiulcers (61.5%), while muscle relaxants were completely unavailable (100%) within the study period (Table 5).

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.



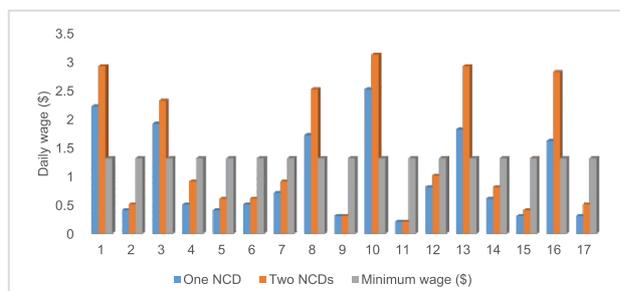
Key: Minimum wage = \$40/month (\$1.3/day), \$1 = N750

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).

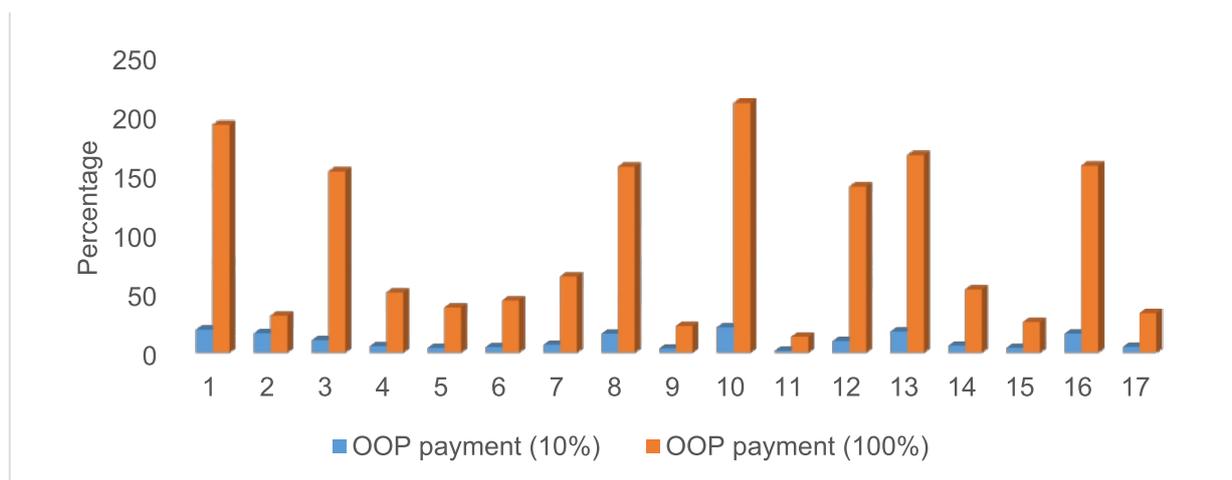


Figure 3: Comparison of co-payment and OOP medicine expenditure

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**).

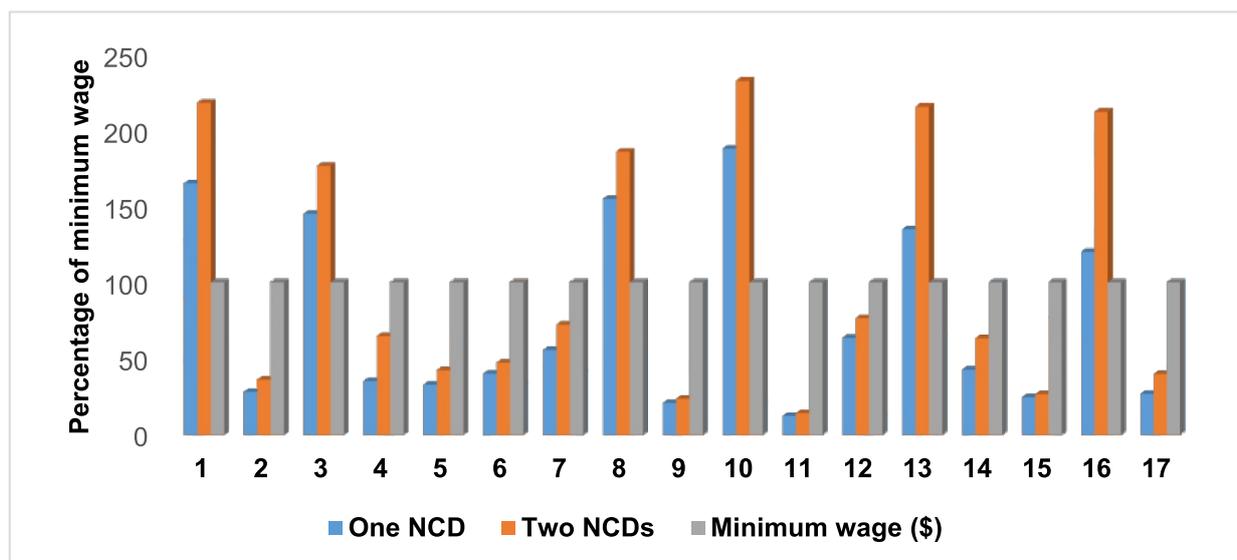


Figure 4: Catastrophic OOP payments versus minimum wage (\$40/month)

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**).

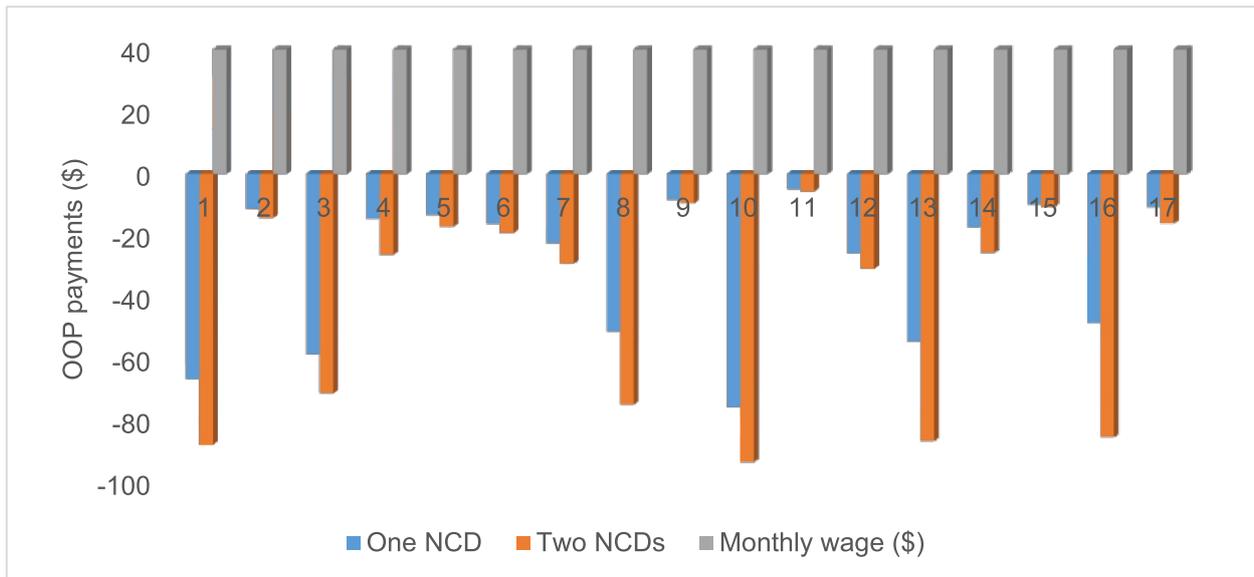


Figure 5: Impoverishing effect of OOP medicine expenditure

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.

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