Preprints.org

Article

Not peer-reviewed version

Managing of Acute Pediatric Cough in Africa: prescription of Cough Suppressants and Associated Complications

Benoît Mukinayi Mbiya * , Denis Kalambayi Mbuyi , Steve Tshiala Kasongo , Valery Daubie

Posted Date: 18 December 2023

doi: 10.20944/preprints202312.1235.v1

Keywords: cough; cough suppressants; pediatrics; complications; Mbujimayi; Democratic Republic of Congo

Preprints.org is a free multidiscipline platform providing preprint service that is dedicated to making early versions of research outputs permanently available and citable. Preprints posted at Preprints.org appear in Web of Science, Crossref, Google Scholar, Scilit, Europe PMC.

Copyright: This is an open access article distributed under the Creative Commons Attribution License which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 18 December 2023 doi:10.20944/preprints202312.1235.v1

Disclaimer/Publisher's Note: The statements, opinions, and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions, or products referred to in the content.

Article

Managing of Acute Pediatric Cough in Africa: Prescription of Cough Suppressants and Associated Complications

Benoît Mukinayi Mbiya [1,2,*], Denis Kalambayi Mbuyi [1,2], Steve Tshiala Kasongo [2] and Valery Daubie [3]

[1] Pediatrics Department, Faculty of Medicine, University of Mbujimayi, 06201 Mbujimayi, Democratic Republic of Congo;
[2] Pediatrics Department, Clinique pédiatrique de Mbujimayi - Mbujimayi paediatric clinic, 06201 Mbujimayi, Democratic Republic of Congo;
[3] Clinical Chemistry Department-Hereditary Red Blood Cell Disorders, Laboratoire Hospitalier Universitaire de Bruxelles-Universitaire Laboratorium Brussel, Université Libre de Bruxelles, 1070 Brussels, Belgium
* Correspondence: benoit.mbiya@um.ac.cd

Highlights:

- Coughing is a reflex that helps remove secretions from the respiratory tract, but using cough suppressants in children can cause serious side effects.
- The study found that in a remote area of the Democratic Republic of the Congo, the use of cough suppressants in children with acute cough led to respiratory distress. Action should be initiated to educate parents and caregivers in resource-limited areas about the risks of using cough suppressants in pediatrics.

What are the main findings?

- While antitussives were prohibited in pediatrics, they continue to be prescribed for children in low-resource countries.
- The use of cough suppressants before hospital admission was linked to respiratory complications
- The most frequent respiratory complication was acute respiratory distress.

What is the implication of the main finding?

- Acute respiratory distress is an important cause of morbidity and mortality in children in low-resource countries.
- The use of cough suppressants in pediatrics contributes to this high morbidity and mortality rate.
- It is vital to raise awareness among parents and healthcare staff.

Abstract: Background: The use of antitussives is a crucial issue in pediatrics and can lead to respiratory complications that can affect the prognosis. Objectives: to determine the frequency of respiratory complications associated with the use of antitussives in pediatrics in a remote city in the Democratic Republic of Congo. Method: This is a cross-sectional retrospective study conducted between January 1, 2017 and December 2022. Patients under 12 years of age with an acute cough were eligible. The parameters studied were treatment with cough suppressants and associated respiratory complications. Results: A total of 218 children suffered from an acute cough. The average age was 11 months 10, the sex ratio (H/F) was 126/92. In 30% of cases, children were treated with cough suppressants for an average of 7 days prior to admission. Respiratory complications were observed in 11% (23/218) of cases. The majority of these complications, 61% (14 of 23), had received antitussive treatment prior to hospitalization. Respiratory complications were associated with cough medications (p-value = 0.0012, relative risk (RR) = 3.66, IC90 [1.696; 7,873]). Acute respiratory distress was reported in 87% (20/23) of cases and was associated with the use of cough suppressants (p-value = 0.0065, RR: 3.060, IC90: [1.433; 6,485]). Conclusion: The use of antitussives in pediatrics poses a risk of acute respiratory distress in a remote city that does not have sufficient human and material resources for management.

© 2023 by the author(s). Distributed under a Creative Commons CC BY license.

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 18 December 2023 doi:10.20944/preprints202312.1235.v1

Keywords: cough; cough suppressants; pediatrics; complications; Mbujimayi; Democratic Republic of Congo

1. Introduction

Coughing is defined as a sudden, audible expulsion of air from the lungs. It is a reflex that helps to externalize bronchial, tracheal and laryngeal secretions or to react to any irritation of the respiratory tract. Its role is beneficial for the protection of the respiratory tract [1]. However, an acute cough causes anxiety in 90% of parents. Their fear is that they will miss a serious illness, that their child will be painful or even choking [2].

Acute upper respiratory tract infections are very common in children, especially during the dry tropical season. These conditions are often accompanied by an acute cough, which often resolves itself after a few weeks[3,4]. Despite its banality, the child's acute cough remains an issue of great concern to parents. This is almost everywhere a major reason for medical consultation. It can affect quality of life, cause anxiety and affect the sleep of parents and children, resulting in iterative consultations. This is a real public health issue [5].

An acute cough is defined as one that lasts less than three weeks. It is subacute (three to eight weeks) and chronic when it lasts more than eight weeks.

In pediatrics, acute cough is most often secondary to high respiratory infections of viral origin and improves spontaneously within 3 weeks. Acute coughing is a common symptom in infants that should be respected. The treatment of cough in pediatrics is primarily that of its cause. Cough medications should not be prescribed in pediatrics [1].

Over-the-counter cough and cold medications are widely used [6,7] and are widely advertised and sold in pharmacies and stores around the world [6] . However, their use has been associated with high toxicity and death [8,9]. Therefore, these drugs are contraindicated in pediatrics [1,8]. Since 2017, the Food and Drug Administration (FDA) has recommended that over-the-counter cough and cold products be prohibited for use in children under 6 years of age [7,10]. Despite these recommendations, these drugs continue to be sold and widely used, especially in sub-Saharan African countries where many of these counterfeit medicines are also found. Most recently, the World Health Organization (WHO) issued a medical product alert" concerning four cough and cold syrups suspected of being linked to "kidney damage" in children and responsible for 66 deaths in The Gambia[11].

We did not find data in the literature on the use of cough suppressants in children in the Democratic Republic of Congo (DRC). This study investigates respiratory complications related to the prescription of cough suppressants in children under 12 years of age in Mbujimayi, DRC. The purpose of this article is to provide clinicians with information on the best practices required in conventional recommendations for managing acute coughs in children.

2. Materials and Methods

- Background to the study

This study was conducted in Mbujimayi, which is the capital of the Eastern Kasai province in the DRC (Figure 1) [12]. It is the third largest city in terms of population. The population of Mbujimayi in 2023 is estimated at 2,900,000 (Mbujimayi world population review 2023), covering an area of 135.12 km2 and corresponding to a population density of 12,450 inhabitants/km².

The study was conducted at the Mbujimayi Paediatric Clinic, one of the largest paediatric facilities in the province of Kasai-Oriental in the DRC. This clinic is a private vertical philanthropic program integrated into the primary health care system in the Democratic Republic of Congo. Currently, this clinic includes a pediatric ward with a capacity of 30 constantly occupied beds, a neonatal ward, a maternity ward and a semi-automated laboratory. However, it is important to note that the city of Mbujimayi also has two large old hospitals (the Bonzola General Reference Hospital and the Dipumba General Reference Hospital) and two other new state hospitals are under

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 18 December 2023 doi:10.20944/preprints202312.1235.v1

construction. Both hospitals are owned by the Bakwanga Mining Company (MIBA), the first industrial diamond production company in the DRC. More than 15 years ago, this company faced very serious financial problems for its recovery. Thus, the social aspects of society, whose hospitals have been abandoned, are in poor condition and need to be rehabilitated. This has a significant impact on the quality of patient care, including pediatric patients. The city of Mbujimayi has a shortage of medical specialists. This is especially in the field of pediatrics where there are only three pediatricians for the whole city.

Figure 1. Location of the city of Mbujimayi on the map of the Democratic Republic of Congo.

- Types of Studies and Inclusion Criteria

This is a cross-sectional retrospective study conducted from January 1, 2017 to December 2022, examining the medical records of pediatric patients consulted during the study period.

Patients under 12 years of age diagnosed with an acute cough were eligible for this study. Chronic cough patients were excluded from our study. We also excluded all TB, asthma and immunocompromised patients (HIV infection).

- Data collection

The data was collected from medical records. These data were subsequently transcribed into a common database (Excel file). We used the convenience sampling technique.

- Study parameters and operational definitions

Socio-demographic parameters included age and sex.

Clinical parameters were the reason for consultation, pulsed oxygen saturation (SpO2), the history of respiratory disease. Complications following the use of antitussives (obstructive rhinitis, worsening cough, fever, respiratory distress).

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 18 December 2023 doi:10.20944/preprints202312.1235.v1

The therapeutic parameters are the notion of taking over-the-counter nasal antitussives or vasoconstrictors, the name of the antitussive used before admission.

Paraclinical parameters: thick gout and chest x-ray.

Acute cough has been defined as a cough lasting less than two weeks. Chronic cough was more than two weeks.

- Statistical analysis

Statistical analyses were conducted using Prism 8.0.1. (GraphPad Software Inc, San Diego, California). The percentage, arithmetic mean and median of patient epidemiology data were calculated. Then we did a Fisher Exact analysis on the contingency table Antitussive versus complications. We also tested each of the identified complications. $P < 0.05$ was considered statistically significant.

3. Results

This study was conducted in 218 children diagnosed with an acute cough for 6 years (January 1, 2017 to December 2022). The average age of patients was 11 months 10, the sex ratio (H/F) was 126/92 and the average length of cough before admission was 8 days 8. Cough was the main complaint in 56% of cases and 30% of children received cough medication for an average of 7 days before hospital admission. Other epidemiological data are described in Table 1.

Table 1. Epidemiological data.

N	**218**
Age (month, mean standard deviation)	11.14 ± 10.08
Gender (H/F)	126/92
Duration of cough before admission (days, mean standard deviation)	7.84 ± 8.31
Initial complaint (number, %):	
Asthenia	1 (0.5)
Headaches	6 (2.8)
Convulsion	2 (0.9)
Diarrhea	4 (1.8)
Difficulty breathing	6 (2.8)
Fever	72 (33.0)
Crying	1 (0.5)
Cough	121 (55.5)
Vomiting	5 (2.3)
Respiratory history (number, %)	15 (6.9)
Taking cough medication (number, %)	65 (29.8)
Cough suppressants (number, %):	
Betatoux (*Promethazine + Ammonium Chloride)*	2 (3.1)
Kaptol *(eucalyptol + guaïfénésine + Vitamin C)*	12 (18.5)
Lemon decoction	3 (4.6)
Eucalyptol	10 (15.4)
Mucoryl (*Diphenhydramine)*	4 (6.2)
Patoux (*Glycirrhiza glabra et Terminalia belerica)*	1 (1.5)
Prednisolone	1 (1.5)
Promethazine	13 (20.0)

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 18 December 2023 doi:10.20944/preprints202312.1235.v1

Sekrol (*ambroxol)*	6 (9.2)
Shaltoux (*Diphenydramine hydrochloride)*	3 (4.6)
Snufen	1 (1.5)
Tousiflex	4 (6.2)
Vifex	5 (7.7)
Nasal vasoconstrictor (number, %)	49 (22.5)
Complications (number, %)	23 (10.6)
Obstructive rhinitis	15 (65.2)
Worsening cough	23 (100)
Fever	13 (56.5)
Respiratory distress	20 (87.0)
SpO_2(%, average standard deviation)	95.81 ± 4.62
RX Thorax (#, %)	29 (13.3)
Normal Thorax RX (number, %)	15 (51.7)

Results from this study showed 11% (23/218) of respiratory complications in children with acute cough. The majority of children with these complications, 61% (14 of 23), had received over-the-counter cough medications prior to hospital admission (Figure 2). Statistical analyses show that the onset of respiratory complications was related to the use of antitussives (p-value = 0.0012, Relative risk (RR) = 3.66, IC90 [1.696; 7.873]). Respiratory complications included aggravation of cough in 100% (23/23) of cases and respiratory distress in 87% (20/23). However, only respiratory distress was associated with cough medication (p-value = 0.0065, RR: 3.060, IC90: [1.433; 6.485]) (Figure 3). Other complications were not associated with the use of cough suppressants (Table 2).

Table 2. Association between use of cough suppressants and onset of respiratory complications.

Parameter		Cough suppressants	No cough suppressants	RR	IC90	p-value
Complications						
	Yes	14	9	3,66	[1,696; 7,873]	0,0012**
	Non	51	144			
Type of complications						
Respiratory distress						
	Yes	13	10	3,06	[1,433; 6,485]	0,0065**
	Non	52	143			
Fever						
	Yes	40	84	1,121	[0,8675; 1,409]	0,375
	Non	25	69			
Worsening cough						
	Yes	65	125	1,007	[0,9503; 1,115]	0,999
	Non	0	1			

** significant, RR: relative risk, CI: 90% confidence interval. Fisher Exact Test,

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 18 December 2023 doi:10.20944/preprints202312.1235.v1

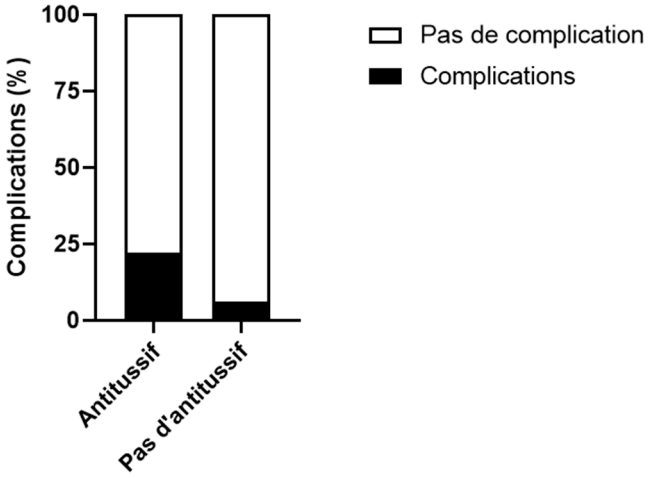

Figure 2. Association between over-the-counter cough medication and the onset of respiratory complications.

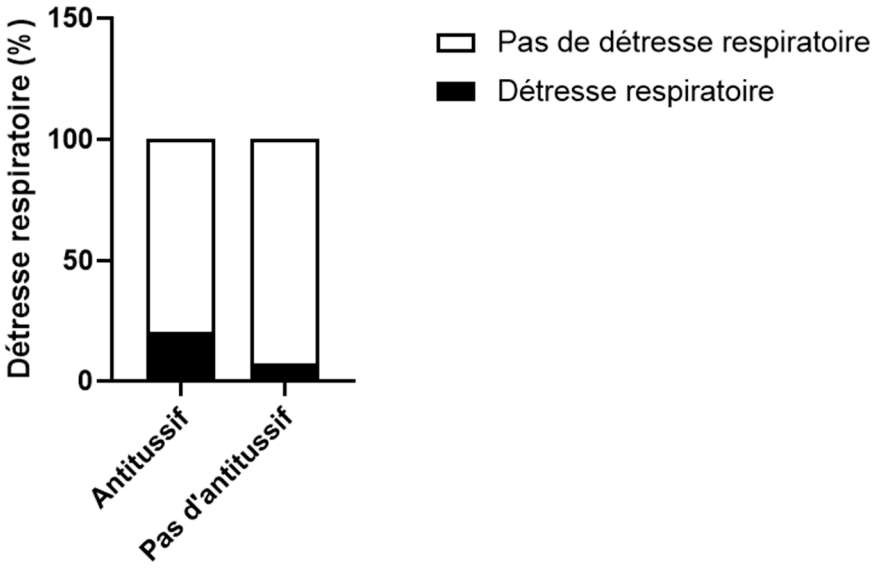

Figure 3. Association between cough medication and respiratory distress.

4. Discussion

This study describes the complications associated with taking antitussives in pediatric acute cough patients. It involved 218 cases of acute cough in children aged 11 months 10 months on average followed at the Mbujimayi Pediatric Clinic in the DRC. This study showed that 30% of children received cough suppressants for an average of 7 days prior to hospital admission. Acute cough is a common symptom in pediatrics that should be respected and the treatment of acute cough should be that of its cause. Cough medication should not be used in pediatrics [1]. For more than 10 years, the Food and Drug Administration (FDA) recommendations have warned against the use of cough and cold medications in young children [7,13]. Despite FDA recommendations, this study shows that cough suppressants continue to be administered in children in Mbujimayi, DRC. These results could be explained by a high frequency of self-medication in Africa [14], a lack of knowledge of qualified medical personnel [15,16], or by the informal drug market in sub-Saharan Africa [17]. Studies also

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 18 December 2023 doi:10.20944/preprints202312.1235.v1

show a scarcity of specialist doctors in African cities, particularly in remote cities [16,18], which could also explain this abuse of cough suppressants in children.

The majority of children with acute coughs with complications, 61% (14 of 23), had received cough medications prior to hospital admission. This study shows that the occurrence of respiratory complications, including respiratory distress, is related to taking cough medication. These results confirm what is reported in the literature. Several studies have already shown the harms of cough suppressants in pediatrics [2,6–8,10,13,19–22]. As noted above, the use of cough suppressants is already prohibited in pediatrics. Cough suppressants can, with side effects up to and including death if management is not appropriate [13]. However, other authors argue for the safety of cough suppressants in children. This is the case of Green and Dart et al, who showed that the rate of adverse reactions associated with cough suppressants in children was low. Deaths are even less frequent. No deaths involved a therapeutic dose. Unsupervised accidental ingestions were the most common types of exposure and single-ingredient liquid pediatric formulations were the most frequently reported products. These features provide an opportunity for targeted prevention efforts [23].

Respiratory diseases are a common cause of death in pediatrics and coughing is the main symptom of these diseases [24,25]. In the face of a cough, parents and health care staff should have the right information on how to manage coughs in children. In the context of the city of Mbujimayi which has a shortage of specialists in pediatrics, underequipped hospitals with very limited possibility of oxygen delivery, prevention of complications related to respiratory diseases must be a priority. The context of the city of Mbujimayi is almost identical to the rest of the Congolese and African cities and therefore, The Ministry of Public Health and Children's Respiratory Programs have a critical role to play in regulating the sale of cough suppressants and in developing training programs for medical personnel in the management of respiratory and community outreach.

This study was conducted in a remote city in the DRC and covers a minimal sample and needs to be conducted in other cities of the country in order to have a complete mapping of the use of antitussives in pediatrics. Such a study could provide data to help policy makers regulate the sale of these products.

5. Conclusions

This study shows that pediatric cough suppressants pose a risk of respiratory complications and confirms what is already described in the literature. It makes it possible to sensitize parents as well as health workers, to stop the use of cough medications in children.

Author Contributions: B.M.M. is the main author of the study, initiated and coordinated the study during the publication, correction, and finalization of the manuscript. She provided important criticisms for improving the content and formed the guidance and support for publication. D.K.M and S.T.K. contribute to the data collection. Analysis and interpretation of data: VD and BMM. All authors were involved in drafting the article or revising it critically for important intellectual content. BMM had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. All authors approved the final version to be submitted for publication.

Funding: This research received no external funding.

Institutional Review Board Statement: The study protocol was reviewed and approved by the Ethics Committee of the Faculty of Medicine of the University of Mbujimayi (Ref. 0012/VD-RSCU/Fac-Méd/UM/DMT/2023). This is a retrospective study based on data acquisition from the medical records of the targeted individuals or a data registry at the time of submission. There was no direct interaction between the researcher and the staff whose files are being studied. The study was carried out in accordance with the principles of the Helsinki II Declaration. The data collected were used only for research purposes. The anonymity of medical records was respected and no personal data was recorded.

Data Availability Statement: The database is available on request.

Acknowledgments: The authors wish to thank all the staff (physicians and nurses) of the Clinique pédiatrique de Mbujimayi.

Conflicts of Interest: The authors do not indicate any conflict of interest.

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 18 December 2023 doi:10.20944/preprints202312.1235.v1

References

1. Bourrillon A, Benoist G. Pediatrics. Elsevier Masson; 2014. 834 pp.
2. Ventaja G, Steyer E, Machu JL, Boivin JM. [Parental representations of children's cough and expectations on its management]. Arch Pediatr Organe Off Soc Francaise Pediatr. 2016 Apr;23(4):348–52.
3. Diop MM, Camara E, Barry IK, Barry MC, Barry A, Doukoure MA, et al. Factors Associated with the Occurrence of Acute Respiratory Infections in Children 0-5 Years Hospitalized at the Donka National Hospital in Conakry. Health Sci Dis [Internet]. 2020 Feb 3 [cited 2023 Jul 17];21(3). Available from: https://www.hsd-fmsb.org/index.php/hsd/article/view/1871
4. N.w.a K, G KAW, M SYP, N TMA, P NT, Numbi OL. The Hospital Epidemiology of acute respiratory infections in children under five years of age with limited resources. (Case of medical structures of the city of Lubumbashi.). Rev Afr Médecine Santé Publique. 2019;2(1):64–74.
5. Boubellout N. Assessment of the parents' opinion on the proposal of honey alone, and on its use in the treatment of acute cough during ENT viruses, in their children aged 1 to 6 years. In 2017 [cited 2023 Jul 16]. Available from: https://www.semanticscholar.org/paper/%C3%89valuation-de-l%E2%80%99avis-des-parents-sur-la-proposition-Boubellout/edb8e87dbe0280e6d15c75393e1ee91749d4cfd6
6. Lam SHF, Homme J, Avarello J, Heins A, Pauze D, Mace S, et al. Use of antitussive medications in acute cough in young children. J Am Coll Emerg Physicians Open. 2021 Jun;2(3):e12467.
7. Dart RC, Paul IM, Bond GR, Winston DC, Manoguerra AS, Palmer RB, et al. Pediatric Fatalities Associated With Over the Counter (Nonprescription) Cough and Cold Medications. Ann Emerg Med. 2009 Apr 1;53(4):411–7.
8. Smith SM, Schroeder K, Fahey T. Over-the-counter (OTC) medications for acute cough in children and adults in community settings. Cochrane Database Syst Rev. 2014 Nov 24;2014(11):CD001831.
9. Chalumeau M, Duijvestijn YCM. Acetylcysteine and carbocysteine for acute upper and lower respiratory tract infections in paediatric patients without chronic broncho-pulmonary disease. Cochrane Database Syst Rev. 2013 May 31;(5):CD003124.
10. Halmo LS, Wang GS, Reynolds KM, Delva-Clark H, Rapp-Olsson M, Banner W, et al. Pediatric Fatalities Associated With Over-the-Counter Cough and Cold Medications. Pediatrics. 2021 Nov;148(5):e2020049536.
11. Medical Product Alert N°6/2022: Substandard (contaminated) paediatric medicines [Internet]. [cited 2023 Jun 12]. Available from: https://www.who.int/news/item/05-10-2022-medical-product-alert-n-6-2022-substandard-(contaminated)-paediatric-medicines
12. Mbujimayi. In: Wikipédia [Internet]. 2023 [cited 2023 Jul 17]. Available from: https://fr.wikipedia.org/w/index.php?title=Mbujimayi&oldid=205549988
13. Burns MM, Renny MH. Pediatric Poisoning Fatalities: Beyond Cough and Cold Medications. Pediatrics. 2021 Nov 1;148(5):e2021052189.
14. Emmanuel C, Koolo BI, Hassimiou CS, Moustapha K, Ouo KO, Binta DF, et al. Self-medication in children aged 0 to 15 years hospitalized in the pediatric department of the Donka National Hospital (Conakry). Health Sci Dis [Internet]. 2022 Jun 29 [cited 2023 Jul 16];23(7). Available from: https://www.hsd-fmsb.org/index.php/hsd/article/view/3763
15. Chronic staff shortages are hampering health systems in Africa, according to a WHO study [Internet]. WHO | Regional Office for Africa. 2023 [cited 2023 Jul 16]. Available from: https://www.afro.who.int/fr/news/des-penuries-chroniques-de-personnel-entravent-les-systemes-de-sante-en-afrique-dapres-une
16. Mukinayi Mbiya B, Tumba Disashi G, Gulbis B. Sickle Cell Disease in the Democratic Republic of Congo: Assessing Physicians' Knowledge and Practices. Trop Med Infect Dis. 2020 Sep;5(3):127.
17. Baxerres C. Why an informal drug market in French-speaking African countries? Polit Afr. 2011;123(3):117–36.
18. Lubumbashi R. Profile of physicians working in the integrated health system of South Kivu in the DRC [Internet]. RIPSEC RDCongo. 2017 [cited 2023 Jul 16]. Available from: https://ripsec.org/ersp-ucb/profil-des-medecins-prestant-dans-le-systeme-de-sante/
19. Ryan T, Brewer M, Small L. Over-the-counter cough and cold medication use in young children. Pediatr Nurs. 2008;34(2):174–80, 184.
20. Mashat GD, Hazique M, Khan KI, Ramesh P, Kanagalingam S, Ul Haq Z, et al. Comparing the Effectiveness of Honey Consumption With Anti-Cough Medication in Pediatric Patients: A Systematic Review. Cureus. 2022 Sep;14(9):e29346.

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 18 December 2023 doi:10.20944/preprints202312.1235.v1

21. Anibasa FO, Abuba T, Dankyau M. Effect of Honey on Cough Symptoms in Children with Upper Respiratory Tract Infection: A Randomised Controlled Trial. West Afr J Med. 2022 Sep 16;39(9):928–34.
22. Manti S, Tosca MA, Licari A, Brambilla I, Foiadelli T, Ciprandi G, et al. Cough Remedies for Children and Adolescents: Current and Future Perspectives. Paediatr Drugs. 2020 Dec;22(6):617–34.
23. Green JL, Wang GS, Reynolds KM, Banner W, Bond GR, Kauffman RE, et al. Safety Profile of Cough and Cold Medication Use in Pediatrics. Pediatrics. 2017 Jun;139(6):e20163070.
24. Benchekroun I, Boubkraoui MEM, Mekaoui N, Karboubi L, Mahraoui C, Dakhama BSB. Epidemiological profile of respiratory pathologies in children at the Children's Hospital of Rabat, Morocco. Pan Afr Med J. 2017 Dec 4;28:288.
25. Ngombe LK, Mbombo-Ditunga, Kameya N, Malingo AA, Kayomb NK, ea Ngolomba JN, et al. Acute respiratory infection and nutritional status in children aged 0-5 years: case of university clinics in Lubumbashi, Democratic Republic of Congo. Pan Afr Med J. 2014 Dec 18;19:393.

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.