Risk factors associated with death among measles cases in eastern Democratic Republic of the Congo

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Background

- Measles remains major killer among children.
- Deaths are due to post measles complications, most commonly pneumonia.
- The strategy to prevent measles complications is based on early administration of preventive treatment, such as vitamin A.
- In MSF we also recommend systematic antibiotics to prevent pneumonia, but this is currently challenged by WHO guidelines. this study aimed to contribute to the discussion.

We aimed to described main complications and identified risk factors for death among measles patients treated in MSF-supported health facilities in Eastern DRC during 2018-2020

Methods

- Retrospective analysis of measles line-list data, routinely-collected by MoH and compiled by MSF in 14 health zones (HZ) where MSF supported case management.
- Summary statistics to describe the demographic and clinical characteristics.
- Log Poisson regression with a multilevel model to distinguish HZ- and individual-associated factors.
- We identified risk factors for death among all cases,
- We identified associations between complications and death among hospitalized patients as complications were recorded only for them.

Ethics

- Approvals from the Ethical committee of the University of Kisangani in the Democratic Republic of Congo and from the MSF Ethics Review Board were obtained

Results

- 26,875 measles cases were recorded between December 2017 and August 2020
- 20,863 patients for whom it was known whether they were treated as outpatients or hospitalized
- 1963 (9.4%) were hospitalized and 106 died (5.5% hospital CFR).
- compared to all cases, deceased patients had:
  - same gender distribution (% F: 49.5% vs 53.8%)
  - younger age (median age 24 months (IQR 13-48) vs. 36 (IQR 18-60))
  - less often vaccinated (74.7% vs. 47%)
  - more severely malnourished (0.9% vs 5.5%)
  - more RDT confirmed malaria (47.3% vs 40.6%)

	Hospitalized patients	Deceased
% Pneumonia (N)	25.7% (456)	73.6% (64)
% Digestive / Diarrhea (N)	24.7% (438)	19.5% (17)
% Occular (N)	7.1% (126)	3.4% (3)
% Croup (N)	3.8% (68)	2.3% (2)
% Asthenia / léthargy (N)	2.1% (37)	2.3% (2)
% Neurologic (N)	0.5% (9)	4.6% (4)
% Otitis (N)	0.4% (7)	0% (0)
% Other (N)	11.2% (199)	12.6% (11)
% None (N)	48.5% (860)	6.9% (6)

Table 1. Frequency of complications among hospitalized measles case , December 2017- August 2020, Democratic Republic of Congo

Among patients hospitalized for measles, pneumonia was the most common complication, affecting a quarter of patients and almost three quarters of those who died.

Variable	Univariate Analysis Death/N	Risk Ratio	CI	P value	Adjusted Analysis Death/N	Risk Ratio	CI	P value
Vaccination status								
Not vaccinated	90/11217	ref			90/10286	ref		
Card or Recall	26/9930	**0.34**	0.22-0.53	<0.001	26/8366	**0.37**	0.24-0.59	<0.001
Missing	19/5730	0.62	0.33-1.14	0.123	19/5073	0.57	0.3-1.07	0.082
Malnutrition status								
Not Malnourished	103/21641	ref			103/18815	ref		
SAM	7/199	**5.46**	2.54-11.71	<0.001	7/194	**5.07**	2.32-11.11	<0.001
MAM	7/480	**2.22**	1.03-4.76	0.041	7/459	**2.06**	0.94-4.53	0.071
Missing	18/4557	1.11	0.63-1.98	0.714	18/4257	0.92	0.49-1.74	0.795
Malaria								
Neg.	68/11218	ref			68/9428	ref		
Pos.	48/7664	**1.56**	1.05-2.32	0.028	48/6851	**1.8**	1.19-2.72	0.005
Missing	19/7995	0.54	0.28-1.03	0.06	19/7446	0.45	0.22-0.92	0.029

Table2. Univariate and Multivariate analysis of comorbidities associated with death among suspected measles case , December 2017- August 2020, Democratic Republic of Congo
**Analysis was adjusted on age group*

Variable		Univariate Analysis Death/N	Risk Ratio	CI	P value	Adjusted Analysis* Death/N	Risk Ratio	CI	P value
Pneumonia									
	No	23/1319	ref			19/1206	ref		
	Yes	64/456	**4.05**	2.34-6.99	<0.001	64/455	**4.29**	2.19-8.4	<0.001
Neurologic									
	No	83/1766	ref			79/1652	ref		
	Yes	45173	**7.13**	2.63-19.34	<0.001	45173	**12.2**	4.01-37.1	<0.001

Table 3. Univariate and Multivariate analysis of complications associated with death among hospitalized measles case , December 2017- August 2020, Democratic Republic of Congo
**Analysis was adjusted on age group of measles vaccination, malnutrition and malaria Rapid Diagnostic Test*

Discussion

Our analysis was limited by use of incomplete routinely collected data, with disease outcomes only recorded for hospitalized patients.
Malaria and pneumonia and neurological complications among hospitalized patients were strong predictors of death, while even incomplete vaccination was strong protector.
Measles vaccination is the most important tool to prevent measles cases and deaths, but when cases do occur, access to early preventive treatment, including antibiotics to prevent pneumonia, might avert additional measles deaths.

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Early access to antibiotics to prevent pneumonia, might avert additional measles deaths.

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