Febrile illness in Mali

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Causes of acute fever

- Malaria is the main cause during raining season 13% of fever
  - ✓ SMC in ongoing country wide – decrease of malaria incidence

- Bacterial causes mainly during dry season
  - ✓ Overuse of antibiotic

- **Algorithm of fever treatment in children under 5**

  - ✓ Mainly malaria during wet season

  - ✓ Respiratory tract infections during cold dry season

  - ✓ Meningitis or measles dry hot season

- 30-40% of fever are unknown origin probably Viral causes not well documented (influenza surveillance, hepatitis, Dengue …)

  - ✓ Serological and molecular evidence of arbovirus circulation in Mali

Febrile illness at Hospital

- Fever is the first reason for consultation and hospitalization in pediatric emergency services

- Several studies in Gabriel Toure hospital indicate 20-50% of fever among in children (Doumbia 2001, Maiga 2003 and Sissoko 2006)

- 49% of children admitted for febrile illness (Campell et al., 2004)
  - ✓Half for malaria and 50% tested RDT and confirmed
  - ✓case fatality rates of the four most common serious infections, excluding malaria, were as follows:
  - ✓12% pneumonia, 37% sepsis, 20% meningitis and 12% enteric fever.

Febrile illness at community health center

Age group	Fever episodes	Refered to hospital	Severe cases
0-4	13105	65	2
5-9	14415	24	18
10-24	19657	13	26
>24	18348	12	11
Total	65525	114	57

Etiologies of acute fevers in children in HGT

- Malaria
- Rhinopharyngitis
- Gastroenteristis
- Respiratory tract infections
- Urinary tract infection
- Meningitis
- Fever of unknown origin

Bacterial causes of febrile illnesses

- Result a pilot study at Hopital Gabriel Toure in children 0-15 years old
  - Malaria RDT positive 33/428 (8%)
  - Blood culture Positive 20/254 (7%)
  - Pneumonia 14/429 (3%)
  - Urinary tract infection 55/357 (15%)

Pneumobama study overall result

- At least 1 microorganism was detected on nasal swabs in 96.6% of cases and 82.3% of controls (crude OR = 6.4 [95% CI: 2.1–19.7], *p<0.001*).

- Overall, 78.8% of cases and 54.2% of controls were co-infected or co-colonized (crude OR =3.3,[95%CI: 1.8–6.0, *p<0.001*).

- Co-detection on nasal swab of *S. pneumoniae* and RSV was more frequent in cases than in controls (respectively, 15.2% [N=18] vs.2.0% [N=2], *p=0.001*).

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Pneumobama study : Microbiological findings of children pneumonia cases swabs, Mali, N = 216.

Microorganisms	Pneumonia cases (n = 118)	Controls (n = 98)	*P*	Crude odds ratio (95% CI)	Adjusted odds ratio[a] (95% CI)
Bacteria					
Streptococcus pneumoniae	85 (72.0)	47 (48.0)	<0.001	2.8 (1.6–4.9)	3.4 (1.6–7.0)
Staphylococcus aureus	23 (19.5)	19 (19.4)	0.98	1.0 (0.5–2.0)	-
Haemophilus influenza	8 (6.8)	6 (6.2)	0.84	1.1 (0.4–3.3)	-
Mycoplasma spp.	0 (0)	1 (1.0)	0.27	NE	-
Chlamydia spp.	0 (0)	0 (0)	-	NE	-
Viruses					
Human metapneumovirus	12 (10.2)	1 (1.0)	0.005	11.0 (1.4–86.0)	17.2 (2.0–151.4)
Coronavirus NL63	1 (0.8)	4 (4.1)	0.12	0.2 (0.02–1.8)	-
Coronavirus 229E	2 (1.7)	0 (0)	0.19	NE	-
Coronavirus OC43	2 (1.7)	4 (4.1)	0.29	0.4 (0.07–2.3)	-
Coronavirus HKU 1	6 (5.1)	2 (2.0)	0.24	2.6 (0.5–13.0)	-
Adenovirus	11 (9.3)	6 (6.1)	0.39	1.6 (0.6–4.4)	-
Enterovirus	12 (10.2)	14 (14.3)	0.35	0.7 (0.3–1.5)	-
Parechovirus	0 (0)	0 (0)	-	NE	-
Rhinovirus	27 (22.9)	24 (24.5)	0.78	0.9 (0.5–1.7)	-
Respiratory syncytial virus	30 (25.4)	6 (6.1)	<0.001	5.2 (2.1–13.2)	7.4 (2.3–23.3)
Parainfluenzae 1	5 (4.2)	0 (0)	0.04	NE	-
Parainfluenzae 2	1 (0.8)	0 (0)	0.36	NE	-
Parainfluenzae 3	5 (4.2)	3 (3.1)	0.65	2.0 (0.4–10.6)	-
Parainfluenzae 4	2 (1.7)	4 (4.1)	0.29	0.4 (0.07–2.1)	-
Influenza A	11 (9.3)	1 (1.0)	0.008	10.0 (1.3–78.7)	10.7 (1.0–112.2)
Infuenza B	0 (0)	0 (0)	-	NE	-
Influenza A(H1N1)	3 (2.5)	0 (0)	0.11	NE	-
Bocavirus	13 (11.0)	12 (12.2)	0.78	0.9 (0.4–2.0)	-

Abbreviations: NE, non estimable.

[a] After multivariate logistic regression, adjusted for the presence of other pathogens, gender, age, and period per quarter.

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Other causes of fever in Mali

- 30-40% fever origin are unknown

- Hemorragic viral fevers: (archive serums showed circulation of most viruses)
  - *Filoviridae* (Ebola and Marburg)
  - *Arenaviridae* (fièvre de Lassa)
  - *Bunyaviridae* (CCHF, RVF, et Hantavirus)
  - *Flaviviridae* (dengue, YF, Zika).
- Dengue outbreak in 2017 periurban area of Bamako (index case in young child 5years old boy

Challenges for diagnosis of Febrile illnesses

- Diagnostic capacity is weak (hospital laboratories are not well equipped)
- National reference laboratories are also very limited
- CICM well equipped but is partially part of MoH
- No national management guidelines for fever illnesses (limited epidemiological surveillance: meningitis, Influenza, yellow fever…)

Needs for the country

- Country wide study of febril illnesses : Bacteria parasites viruses in human and animal
- Identify strains and AMR
- Identify hotspots for surveillance