A prospective hospital-based surveillance of Rotaviral Disease in children at the Port Moresby General Hospital, Papua New Guinea.

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Introduction

- Acute Gastroenteritis – one of the leading cause of illness and death in infancy & childhood worldwide.¹

- Viral pathogens - ~70% cases; Rotavirus is the most common.²

- A double-stranded RNA virus; in the family Reoviridae.²

- Group A Rotavirus- most common; >90% of acute diarrhoeal disease in children.²
Rotavirus Globally

- World wide ~40% of diarrhoeal hospitalizations in <5 yrs due to RV. (WHO Surveillance 2001-2008)³

- Estimated; > 2 million –hospitalized annually; >500 000 die from the disease.³

- P[8]G1 strain most predominant worldwide – 52.2% most countries⁴
Rotavirus in PNG

• Diarrhoeal disease accounts for 10% of admissions with case fatality rate 2.7%
  (PNG Department of Health child morbidity & mortality -2011)

• Only limited studies (Goroka) have been conducted to determine the burden of Rotavirus in PNG

• RV detected 31.2% (n=254) with mortality rate of 2.4%
  (Horwood. P et al. 2012)

• PMGH- Diarrhoeal disease 11.5% of OPD visits & hospitalizations.
  (PMGH COPD records-2012)

• Rotavirus is NOT diagnosed at PMGH & its burden UNKNOWN.
Vaccination considered most effective public health strategy to prevent infection & reduce burden.

Rotavirus vaccine efficacy (74%; 95% CI 35-90%) against severe RV infection. (systemic review 2010)

Data on disease burden will guide recommendations for vaccine use in future.
AIM:

- To estimate the burden of Rotavirus gastroenteritis at the Port Moresby General Hospital.

OBJECTIVES:

1. What proportion of acute diarrhoeal cases are due to rotavirus at PMGH?
2. What are the genotypic patterns of Rotavirus at PMGH?
3. What’s the contribution of rotavirus to deaths in children at PMGH?
METHODOLOGY

STUDY DESIGN:

• Prospective hospital based surveillance from Sept 2011-Dec 2012
Study Participants

INCLUSION:
• Children (age > 7 days; <5 yrs) with acute diarrhoea
• Verbal consent given
• No blood in stool

EXCLUSION:
• Age range not met
• No verbal Consent
• Bloody diarrhoea
Data Collection & Sampling Strategy

• Following verbal consent- standard questionnaire used

• Hospitalized in-patients- additional information obtained from medical files.
  ▪ Specimens were collected at convenience
  ▪ 2 Fecal samples (4-5mls) were collected using a feeding tube passed PR
Stool Sample Handling & Lab Analysis

- Fecal samples collected within 48 hours

- Stored in an esky (4°C) prior to transfer to CPHL

- Analysis for Group A Rotavirus using ELISA test kit per manufacturers instruction.

- Stored at -20°C

- Genotyping RT-PCR - Melbourne
Statistical Analysis & Ethics

- All data entered onto Excel Spreadsheet & analysed using SPSS (version 19; SPSS Inc Chicago, IL USA)
- Statistical analysis of categorical variables was performed using x2 tests (p value <0.05)
- Ethical approval obtained from both UPNG SMHS research & ethical committee and PMGH Management.
RESULTS
Figure 1: Study Participants and Stool Sample Results.

TOTAL ENROLLED - 267

12 EXCLUDED
• 10 samples misplaced CPHL
• 2 – no stool samples received

TOTAL ANALYSED - 255

ROTA VIRUS ELISA POSITIVE
120 (47.06%)

NO ENTEROPATHOGENS ISOLATED; NO OCP SEEN
120 (100%)

ROTA VIRUS ELISA NEGATIVE
135 (52.94%)

ENTEROPATHOGENIC E.COLI ISOLATED
5 (3.7%)

NO ENTEROPATHOGENS ISOLATED; NO OCP SEEN
130 (96.3%)

GENOTYPIC RESULTS
• 1st 34 - all P[8]G3
• Rest - pending
Figure 2: Age distribution of Rotaviral ELISA positive patients

- 35% (42) RV detected - <6 months age
- 88.3% (106) RV detected - <1 year age
**Table 1: Demographical parameters**

<table>
<thead>
<tr>
<th>Variables</th>
<th>RV Positive (n=120)</th>
<th>RV Negative (n=135)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>48.3%</td>
<td>39.3%</td>
<td>0.92</td>
</tr>
<tr>
<td>M</td>
<td>51.7%</td>
<td>60.7%</td>
<td>0.72</td>
</tr>
<tr>
<td><strong>Water Source</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Well/drum</td>
<td>3.2%</td>
<td>4.4%</td>
<td>0.39</td>
</tr>
<tr>
<td>Communal pipe</td>
<td>73%</td>
<td>66.7%</td>
<td>0.59</td>
</tr>
<tr>
<td>In-house</td>
<td>42%</td>
<td>28.9%</td>
<td>0.11</td>
</tr>
<tr>
<td><strong>Toilet type</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bush/sea</td>
<td>17.5%</td>
<td>20.7%</td>
<td>0.6</td>
</tr>
<tr>
<td>Pit</td>
<td>48.3%</td>
<td>50.4%</td>
<td>0.8</td>
</tr>
<tr>
<td>Flush</td>
<td>34.2%</td>
<td>28.9%</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Feeding Practice</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exclusive BF</td>
<td>20.8%</td>
<td>23%</td>
<td>0.73</td>
</tr>
<tr>
<td>Bottle</td>
<td>22.5%</td>
<td>21.5%</td>
<td>0.87</td>
</tr>
<tr>
<td>Mixed (Bot+BF)</td>
<td>5.8%</td>
<td>7.4%</td>
<td>0.65</td>
</tr>
<tr>
<td>Solids + BF</td>
<td>50.8%</td>
<td>48.1%</td>
<td>0.78</td>
</tr>
</tbody>
</table>
Table 2: Clinical Findings & Mx on Initial OPD presentation

<table>
<thead>
<tr>
<th></th>
<th>RV ELISA Positive (n=120)</th>
<th>RV ELISA Negative (n=135)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nutritional Status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Well nourished</td>
<td>88.3%</td>
<td>73.3%</td>
<td>0.23</td>
</tr>
<tr>
<td>Moderate Malnutrition</td>
<td>11.7%</td>
<td>23%</td>
<td>0.055</td>
</tr>
<tr>
<td>Severe Malnutrition</td>
<td>0%</td>
<td>3.7%</td>
<td>0.054</td>
</tr>
<tr>
<td><strong>Hydration status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some dehydration</td>
<td>55%</td>
<td>60.7%</td>
<td>0.59</td>
</tr>
<tr>
<td>Severe; no shock</td>
<td>45%</td>
<td>39.3%</td>
<td>0.53</td>
</tr>
<tr>
<td><strong>Initial Therapy given</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV fluids (mainly HSD)</td>
<td>100%</td>
<td>100%</td>
<td>1</td>
</tr>
<tr>
<td>Ready-made ORS</td>
<td>0%</td>
<td>0%</td>
<td>1</td>
</tr>
<tr>
<td><strong>Additional meds given</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>11.7%</td>
<td>16.3%</td>
<td>0.38</td>
</tr>
<tr>
<td>Zinc</td>
<td>6.7%</td>
<td>3%</td>
<td>0.23</td>
</tr>
<tr>
<td>Antibiotics</td>
<td>30.8%</td>
<td>31.1%</td>
<td>0.97</td>
</tr>
</tbody>
</table>
Figure 3: Outcome of OPD Mx of Acute Gastroenteritis.

Rotavirus ELISA POSITIVE (n=120)
- 10.8% Discharged Home
- 89.20% Admitted to wards

Rotavirus ELISA NEGATIVE (n=135)
- 14.1% Discharged Home
- 85.90% Admitted to wards
Figure 4: Main reason for Admission to wards

- Still Dehydrated: 30.80%
- Persistent Vomiting: 10.50%
- Severe Dehydration: 7.70%
- Drinking/feeding poorly: 0%
- Other: 53.80%
- Additional: 7.70%
- 10.50%
- 0%
- 7.70%
- 63.20%
- 26.30%

Rotavirus ELISA POSITIVE (n=13)
Rotavirus ELISA NEGATIVE (n=19)
Figure 5: Associated Co-morbidities

- Rotavirus ELISA POSITIVE (n=13)
- Rotavirus ELISA NEGATIVE (n=19)

- None: 92.30%
- Severe Malnutrition: 78.90%
- Others: 0%

- Rotavirus ELISA POSITIVE: 21.10%
- Rotavirus ELISA NEGATIVE: 7.70%
- Others: 0%
Figure 6: Complications Observed

<table>
<thead>
<tr>
<th>Condition</th>
<th>Rotavirus ELISA POSITIVE (n=13)</th>
<th>Rotavirus ELISA NEGATIVE (n=19)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dehydration ONLY</td>
<td>61.50%</td>
<td>31.60%</td>
</tr>
<tr>
<td>Hypokalemia AND dehydration</td>
<td>38.50%</td>
<td></td>
</tr>
<tr>
<td>Hypovolaemic shock</td>
<td>68.40%</td>
<td></td>
</tr>
<tr>
<td>Renal Failure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical Metabolic Acidosis</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 7: **Outcome of In-patient Admissions**

- Discharged
- Died
- Others

- Rotavirus ELISA POSITIVE (n=13)
- Rotavirus ELISA NEGATIVE (n=19)

Figure 8: **Length of Hospital Stay in RV ELISA Positive in-patients**

- RV ELISA Positive (n=13)
DISCUSSIONS

• Rotavirus detected 47.06% (n=255) & is similar to studies done in Goroka and within the Western Pacific Region.
  – Pratt et al 1992 – 68% (n=30)
  – Howard et al 2000 – 23% (n=1526)
  – Fiji, Malaysia and Thailand; 39%, 38% & 39% respectively

• High proportion 88.3%(n=120) of RV hospitalization - first year of life (figure 2);

  ▪ Vaccine initiation in early infancy (age 2, 4 & 6 months) as shown in other countries will prevent RV infection prior to peak age group and hence reduce burden.
- Preventative measures such as hygiene & sanitation have been shown to reduce the incidence of diarrhoea due to bacteria and parasites.

- This is not seen in Rotaviral diarrhoeal disease; global incidence in the developed and developing nations are still very much similar.

- In this study (Table 1) there was no statistical significance observed in the RV positive and negative groups – residence, water & sanitation and feeding practices.
Main clinical management approach to diarrhoeal disease is addressing dehydration – ORS, IV fluids & Zinc.

In this study (table 2)
- <10% (n=255) were given Zinc
- No one was given ready-made ORS
- 100% (n=255) were given IV fluids for rehydration
- 30% - received antibiotics

Huge economic burden placed on our health system;
- Inconsistent supply of Zinc,
- ORS not made readily available in COPD
- IV fluids only for rehydration & routine use of antibiotics

Vaccination may be the optimal option to reduce burden.
CONCLUSION

- This study has established that Rotavirus is an important cause of Morbidity in children under age 5 years at the PMGH.

- Vaccination is the way forward if we are to reduce the disease burden of Rotavirus.

- Further studies are required in different locations of PNG to characterize Rotavirus strains circulating within the country, prior to
ACKNOWLEDGEMENT

1. Dr. Paulus Ripa for tremendous support with statistical analysis
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3. WHO & Dr. Siddharta Datta for the introduction and financial support of the project.
4. All patients who participated
REFERENCES


Questions ?