Efficacy of magnesium sulfate for treating the acute organophosphorus pesticide poisoning - A Pilot Trial

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Milieu

- Second commonest cause of mortality in Bangladesh (BHB-1999)
- Commonest poisoning in Bangladesh
- High case fatality are multifactorial
- Antidote - 1. Atropine  2. Pralidoxime
- Adjuvant drugs – 1. Bicarbonate  
  2. Magnesium sulphate  3. Fresh Frozen plasma and 4. pancuronium
Magnesium Sulfate
Literature review

• Animal experiments and non-controlled trial report a benefit of Magsulf in acute OP poisoning

• RONALD J. BRADLEY (1986).
Objective

• To provide improved evidence of efficacy and safety of Magnesium sulfate

• To describe the adverse event reported due to Magnesium sulfate
Methodology

• **Type of study:** Randomized trial.
• **Place of study:** One Adult Medicine Unit.
• **Period of study:** 1\textsuperscript{st} July 2006 - 30 June 2007.
• **Enrollment:**
  - Aged 12-60 years
  - Symptomatic acute OP poisoning
  - Not received advanced medical care
  - Admitted within 24 hours.
Flow Chart of OP Enrolment

Total OP poisoning case
n = 93

Enrolled
n = 50

- Mild
  n = 07

- Mixed
  n = 03

- H/O antidot
  n = 03

Not enrolled
n = 43

- Immediate death
  n = 13

- Others
  n = 13

Control
n = 10

- G-A (4gm)
  n = 16

- G-B (8gm)
  n = 8

Case
n = 40

- G-C (12gm)
  n = 8

- G-D (16gm)
  n = 8
Treatment

**Both groups** - Gastric lavage, I/V atropine, and Pralidoxime. Supportive and intensive care therapy will be decided by the discretion of the clinician.

**Test groups** - Magnesium sulfate (20% MgSO4.7H2O) at a dose of 4g/day i.v over 10-15min; increased every 10 patients interval at rate of 4g/day upto 16g/day.
Measurements

- Number of dying patients
- Atropine doses and duration
- Magnesium level (serum and urinary)
- Biochemical and hematological investigations: Electrolyte, Bl. Sugar, urea, creatinine, CPK, ECG.
- Intensive care therapy and mechanical ventilation
- Complication
# Results

<table>
<thead>
<tr>
<th></th>
<th>Case</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>25.2±10.04</td>
<td>24.4±9.24</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td><strong>Sex</strong></td>
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<td>Female</td>
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<td></td>
</tr>
<tr>
<td>Female</td>
<td>14</td>
<td>04</td>
</tr>
<tr>
<td><strong>Severity of Poisoning</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>32</td>
<td>04</td>
</tr>
<tr>
<td>Severe</td>
<td>08</td>
<td>06</td>
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</table>
## Results

<table>
<thead>
<tr>
<th>GCS 4-6</th>
<th>GCS 6-9</th>
<th>GCS 9-11</th>
<th>GCS 11-14</th>
<th>Magnesium</th>
<th>Severity</th>
<th>Moderate</th>
<th>Severe</th>
<th>Total</th>
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<tbody>
<tr>
<td>03</td>
<td>02</td>
<td>01</td>
<td>04</td>
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<td>04</td>
<td>06</td>
<td>10</td>
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<tr>
<td>00</td>
<td>02</td>
<td>01</td>
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<td>4 gm/day magnes</td>
<td>13</td>
<td>13</td>
<td>03</td>
<td>16</td>
</tr>
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<td>08</td>
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<td>02</td>
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## Cross-Correlation

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<th>Intermediate syndrome</th>
<th>Assisted ventilation provided</th>
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<tr>
<td>4gm</td>
<td>Intermediate</td>
<td>3</td>
</tr>
<tr>
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<td>syndrome</td>
<td></td>
</tr>
<tr>
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<td>No</td>
<td>3</td>
</tr>
<tr>
<td>8gm</td>
<td>Intermediate</td>
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<td></td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>12gm</td>
<td>Intermediate</td>
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</tr>
<tr>
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<td>syndrome</td>
<td></td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td></td>
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<td>1</td>
</tr>
<tr>
<td>not given</td>
<td>Intermediate</td>
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</tr>
<tr>
<td></td>
<td>syndrome</td>
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</tr>
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</table>
## Atropine Requirement

### Descriptives

<table>
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<th>Total amount of atropine (mg.)</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
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<tbody>
<tr>
<td>4gm</td>
<td>16</td>
<td>289.6875</td>
<td>275.77662</td>
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<td>8gm</td>
<td>8</td>
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<td>12gm</td>
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<td>16gm</td>
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<td>337.2600</td>
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<td>Total</td>
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<td>242.7000</td>
<td>265.73329</td>
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## Outcome

Number of dying patients

<table>
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<tr>
<th>Magnesium given</th>
<th>4gm</th>
<th>8gm</th>
<th>12gm</th>
<th>16gm</th>
<th>not given</th>
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</thead>
<tbody>
<tr>
<td>Recovered</td>
<td>13</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Death</td>
<td>3</td>
<td>2</td>
<td>1</td>
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<td>6</td>
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<tr>
<td>Count</td>
<td>81.3%</td>
<td>75.0%</td>
<td>87.5%</td>
<td>100.0%</td>
<td>40.0%</td>
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<tr>
<td>Percent</td>
<td>18.8%</td>
<td>25.0%</td>
<td>12.5%</td>
<td>0.0%</td>
<td>60.0%</td>
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</table>

Graph showing the outcome of patients receiving different doses of magnesium compared to those not receiving it.
<table>
<thead>
<tr>
<th>Renal complication</th>
<th>Cardiovascular complications</th>
<th>ARDS</th>
<th>Magnesium given</th>
<th>Outcome</th>
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<tr>
<td></td>
<td></td>
<td></td>
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<td>Recovered</td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
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<td>Not given</td>
<td>1</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>4gm</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not given</td>
<td>0</td>
<td>1</td>
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<tr>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Not given</td>
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<tr>
<td>No</td>
<td>No</td>
<td>4gm</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8gm</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12gm</td>
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<tr>
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<td></td>
<td>16gm</td>
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<tr>
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<td>Not given</td>
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<td>3</td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td>4gm</td>
<td>1</td>
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</table>
## Addendum

### CPK level

<table>
<thead>
<tr>
<th>Intermediate syndrome</th>
<th>Mean</th>
<th>N</th>
<th>Std. Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
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<tr>
<td>Yes</td>
<td>757.65</td>
<td>4</td>
<td>721.0785</td>
<td>250</td>
<td>1801</td>
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<tr>
<td>No</td>
<td>939.0859</td>
<td>17</td>
<td>881.6541</td>
<td>85.32</td>
<td>2709</td>
</tr>
<tr>
<td>Total</td>
<td>904.5267</td>
<td>21</td>
<td>839.7464</td>
<td>85.32</td>
<td>2709</td>
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</table>
## Addendum

### Paired Samples Statistics

<table>
<thead>
<tr>
<th>Pair</th>
<th>Parameter</th>
<th>Mean</th>
<th>N</th>
<th>Std. Deviation</th>
<th>Sig.</th>
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<tbody>
<tr>
<td>Pair 1</td>
<td>Na level before intervention</td>
<td>135.58</td>
<td>25</td>
<td>5.754057</td>
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<tr>
<td></td>
<td>Na level after 24 hours</td>
<td>138.02</td>
<td>25</td>
<td>5.113707</td>
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</tr>
<tr>
<td>Pair 2</td>
<td>K level before intervention</td>
<td>3.6096</td>
<td>25</td>
<td>0.507038</td>
<td>0.449</td>
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<td></td>
<td>K level after 24 hours</td>
<td>3.7068</td>
<td>25</td>
<td>0.535698</td>
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<tr>
<td>Pair 3</td>
<td>Cl level before intervention</td>
<td>96.92</td>
<td>25</td>
<td>6.013388</td>
<td>0.211</td>
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<tr>
<td></td>
<td>Cl level after 24 hours</td>
<td>98.732</td>
<td>25</td>
<td>5.743672</td>
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<tr>
<td>Pair 4</td>
<td>TCO2 level before intervention</td>
<td>23.74583</td>
<td>24</td>
<td>2.208871</td>
<td>0.141</td>
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<tr>
<td></td>
<td>TCO2 level after 24 hours</td>
<td>24.475</td>
<td>24</td>
<td>2.816296</td>
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</table>
Conclusion

• We escalated the magnesium dose upto 16 gm without any adverse effect.

• This study is very small; numerous parts of the methodology were incompletely described.

• Thus we believe further research is required before this treatment can be universally recommended.
THANKS