IMMUNOCROMATOGRAFİİ METHOD FOR ROTAVİRUS DETECTION PROVIDES GOOD ACCURACY IN DIAGNOSIS OF ROTAVİRUS DIARRHEA IN CHILDREN

Sherly Yuniarchan¹, Andy Darma¹, Alpha Fardah Athiyyah¹, IGM Reza Gunadi Ranuh¹, Subijanto Marto Sudarmo², Boediono²
¹Department of Pediatrics, Faculty of Medicine, Universitas Airlangga
²Public Health-Medical Prevention, Faculty of Medicine, Universitas Airlangga, Surabaya

ABSTRAK

Kata kunci: immunokromatografi, diare rotavirus, akurasi diagnostik, anak

ABSTRACT
Rotavirus infections are a major cause of diarrhea in children under 5 years in both the developed and developing countries. Gold standard diagnostic method for rotavirus diarrhea is RT-PCR but it is expensive and long time. Immunochromatography is a new diagnostic method that is fast, easy and cheap but the variation in diagnostic accuracy is still very wide in various countries. The objective of this study was to evaluate the accuracy of the immunochromatography method as compared to RT-PCR method in the diagnosis of rotavirus diarrhea in children. Cross-sectional study was conducted in children aged 1-60 months with acute diarrhea hospitalized at gastroenterology ward Dr. Soetomo Hospital on January until June 2014. Patients, who had received rotavirus immunization 1 month before the test, were excluded from this study. Immunochromatography method was using BD Rota/Adeno Examine™ stick (Beckton Dickinson Japan Co., Ltd.). Identification of rotavirus by RT-PCR was performed at the Institute of Tropical Disease (ITD), Airlangga University. Sensitivity, and specificity, positive predictive value (PPV), negative predictive value (NPV) and likelihood ratio (LH) were calculated for the immunochromatography method. A total of 80 children were included. The sensitivity, specificity, PPV, NPV and LH of immunochromatography respectively were 77.6%, 63.6%, 84.9%, 51.85% and 2.13. In conclusion, immunochromatography method for rotavirus detection provides good accuracy in diagnosis of rotavirus diarrhea in children. (FMI 2015;51:142-148)

Keywords: immunochromatography, rotavirus diarrhea, diagnostic accuracy, children

Correspondence: Sherly Yuniarchan, Department of Pediatrics, Faculty of Medicine, Universitas Airlangga, Jalan Prof. Dr. Moestopo 47, Surabaya 60131, Indonesia. Email: sherly_yuniarchan@yahoo.com.sg

INTRODUCTION
Rotavirus infections are a major cause of severe diarrhea in children aged under five in both the developed and developing countries. Rotavirus diarrhea caused > 500,000 deaths of children under five each year worldwide and > 80% of which occur in developing countries (WHO 2009). In Indonesia, 60% causes of hospitalization and 41% causes of outpatient clinic in children under five were rotavirus diarrhea (Soenarto et al 2009).

Management of rotavirus diarrhea does not require antibiotic therapy. Improper use of antibiotics will increase antibiotic resistance, cost of treatment and risk of side effects. Unfortunately, rotavirus diarrhea or other infections are difficult to distinguish clinically. Therefore it needed rotavirus diarrhea diagnostic tool
that is fast, easy, inexpensive and practical for the right treatment.

Rapid progress in the field of diagnostic investigations allows the identification of rotavirus. Methods of diagnosis of rotavirus from stool specimens that have been used include viral culture, electron microscopy (EM), antigen detection (enzyme immunoassay (EIA), latex agglutination (LA) and immunochromatography (ICTG)), and detection of nucleic acids (polyacrylamide gel electrophoresis (PAGE) and Reverse Transcription-Polymerase Chain Reaction (RT-PCR)) (Gentsch et al 2009). Gold standard diagnostic method for rotavirus diarrhea is RT-PCR but it is expensive and the results require a relatively long time to obtain.

Immunochromatography rotavirus is a new diagnostic method that is fast, easy and cheap but the variation in diagnostic accuracy is still very wide in various countries. Several studies have compared the immunochromatography by RT-PCR. The research on 228 stool specimens of children who have acute diarrhea in Spain obtained a sensitivity of 99% and specificity of 96% (Wilhelmi et al 2001). While the research on 104 children with diarrhea in Vietnam obtained a sensitivity of 87.8% and a specificity of 93.3% (Nguyen et al 2007). Otherwise another result obtained in the study of 100 stools from children under 2 years suffering from diarrhea in India only obtained a sensitivity of 53.1% and a specificity of 100% (Manjula 2013). The difference in accuracy may be caused by rotavirus strain differences in various countries.

Based on the above facts, it is necessary to evaluate the accuracy of immunochromatography as a diagnostic tool for rotavirus diarrhea in infants and young children. The results of the immunochromatography will be compared to the RT-PCR method as the gold standard for the identification of rotavirus infection.

MATERIALS AND METHODS

A cross sectional study was undertaken at the gastroenterology ward, Dr. Soetomo Hospital, Surabaya, Indonesia from January to June 2014. The study has been approved by the Health Research Ethics Committee of Dr. Soetomo Hospital. Research subjects were all patients with diarrhea treated in the child care ward at Dr. Soetomo Hospital meeting the criteria as research subjects. Physical examination were performed on all study subjects, parents of study subjects were interviewed using a questionnaire, and stool specimens were collected. Stool specimens were then sent to the laboratory as soon as possible, or in no more than 2x24 hours after starting treatment so as to maintain the validity of the specimen. The questionnaires were rechecked and entered into the data base. Immunochromatography of stool rotavirus was done in bed-side examination using BD Rota/Adeno Examine TM kit (Beckton Dickinson Japan Co., Ltd.). All fecal samples were examined by reverse transcriptase-polymerase chain reaction (RT-PCR) for rotavirus identification at the Institute of Tropical Disease (ITD), Universitas Airlangga, using Viral Nucleic Acid Extraction Kit II (Geneaid Biotech Ltd., New Taipei) for isolation of rotavirus, QIAGENTM Longrange 2-step RT-PCR Kit (Qiagen, Valencia, CA), and using the oligonucleotide primer (Integrated DNA Technologies, Singapore) according to the WHO manual for the detection of rotavirus. Three inclusion criteria were as follows: children aged 1 - 60 months, showing a history of diarrhea, defined as more than 3 times per day with a liquid consistency, and showing diarrhea less than 3 days prior to hospitalization.

Patients, who had received rotavirus immunization 1 month before the test, were excluded from this study. The minimum required number of samples in this study was 78 samples. Statistical analysis was performed using SPSS statistics 17.0. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and likelihood ratio (LH) were calculated for the immunochromatography method.

RESULTS

In this study there were 80 patients meeting the inclusion and exclusion criteria. Overall all patient stool samples were extracted and examined by immunochromatography BD Rota/Adeno Examine TM kits and RT-PCR of rotavirus at ITD.

Characteristics of the study subjects are presented in Table 1. Male subjects dominate (57.5%). Subjects ages varied from 2 months to 60 months. Highest age group 6-12 months (37.5%). Group of subjects aged less than 6 months showed the lowest proportion (10.2%). Overall, most of the subjects showed good nutritional status (97.5%) and the rest with wasted nutritional status (2.5%). There are 77.5% subjects were ever breastfed, but most are long breastfeeding < 6 months (62.5%). There were no data on the quality of breast milk given. Maternal education of research subjects were mostly secondary level (junior and senior high school) (73.8%).

The clinical features of the study subjects are presented in Table 2. In the group of rotavirus diarrhea, subjects came to the hospital after suffering from diarrhea of 1.9 (SD 0.73) a day with a frequency of 6.9 (SD 4.18) times
per 24 hours. Other symptoms experienced by the subject of rotavirus diarrhea is vomiting (79.3%) with a duration of vomiting 1.6 (SD 1.32) and the frequency of vomiting per day 3.4 (SD 2.94) times. A total of 81% of the study subjects had fever rotavirus diarrhea with fever duration of 1.8 (SD 1.92) a day. The degree of dehydration experienced by study subjects rotavirus diarrhea is dehydration mild-moderate (87.9%) and severe dehydration (8.6%). A symptom of upper respiratory tract infections (colds and or cough) was found in 29.3% of subjects with rotavirus diarrhea. In the group of rotavirus diarrhea, watery diarrhea types found in 82.8% of subjects and mushy diarrhea in 17.2% of subjects research.

Rotavirus immunochromatography examination is qualitative assay. In this study, positive immunochromatography showed in 53 (66.3%) children and negative 27 (33.8%) children. From 53 children with positive immunochromatography obtained 45 (84.9%) children positive by RT-PCR. Whereas from the 27 children with negative immunochromatography obtained 13 (48.2%) children with positive RT-PCR (Table 3). Based on Table 3, the accuracy of immunochromatography diagnostic tests can be seen table 4.

Table 1. Characteristics subjects

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (months)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 – 5</td>
<td>10</td>
<td>12.5</td>
</tr>
<tr>
<td>6 – 12</td>
<td>30</td>
<td>37.5</td>
</tr>
<tr>
<td>12 – 24</td>
<td>29</td>
<td>36.3</td>
</tr>
<tr>
<td>&gt; 24</td>
<td>11</td>
<td>13.8</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>46</td>
<td>57.5</td>
</tr>
<tr>
<td>Female</td>
<td>34</td>
<td>42.5</td>
</tr>
<tr>
<td>Nutritional status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wasted</td>
<td>2</td>
<td>2.5</td>
</tr>
<tr>
<td>Normal</td>
<td>78</td>
<td>97.5</td>
</tr>
<tr>
<td>Maternal Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>10</td>
<td>12.5</td>
</tr>
<tr>
<td>Middle</td>
<td>59</td>
<td>73.8</td>
</tr>
<tr>
<td>High</td>
<td>11</td>
<td>13.8</td>
</tr>
<tr>
<td>Breastfeeding State</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>5</td>
<td>6.3</td>
</tr>
<tr>
<td>&lt; 6 months</td>
<td>50</td>
<td>62.5</td>
</tr>
<tr>
<td>6 – 12 months</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>&gt; 12 months</td>
<td>17</td>
<td>21.3</td>
</tr>
</tbody>
</table>

Table 2. Clinical Manifestations

<table>
<thead>
<tr>
<th>Variable</th>
<th>PCR rotavirus (+)</th>
<th>PCR rotavirus (-)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N (%)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>Duration of diarrhea (day)</td>
<td>1.9 (0.73)</td>
<td>2.1 (0.81)</td>
</tr>
<tr>
<td>Diarrhea frequency/day (x)</td>
<td>6.9 (4.18)</td>
<td>6.9 (2.89)</td>
</tr>
<tr>
<td>Vomitting</td>
<td>46 (79.3)</td>
<td>16 (72.7)</td>
</tr>
<tr>
<td>Duration of vomiting (day)</td>
<td>1.6 (1.32)</td>
<td>1.5 (1.22)</td>
</tr>
<tr>
<td>Vomitting frequency/day (x)</td>
<td>3.4 (2.94)</td>
<td>4.6 (4.25)</td>
</tr>
<tr>
<td>Fever</td>
<td>47 (81)</td>
<td>16 (72.7)</td>
</tr>
<tr>
<td>Duration off ever (day)</td>
<td>1.8 (1.92)</td>
<td>2.1 (3.12)</td>
</tr>
<tr>
<td>Diarrhea Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Watery</td>
<td>48 (82.8)</td>
<td>16 (72.7)</td>
</tr>
<tr>
<td>Loose</td>
<td>10 (17.2)</td>
<td>6 (27.3)</td>
</tr>
<tr>
<td>Bloody</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Mucous</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>With URTI (cough/cold)</td>
<td>17 (29.3)</td>
<td>8 (36.4)</td>
</tr>
<tr>
<td>Dehydration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No dehydration</td>
<td>2 (3.4)</td>
<td>0</td>
</tr>
<tr>
<td>Some dehydration</td>
<td>51 (87.9)</td>
<td>19 (86.4)</td>
</tr>
<tr>
<td>Severe dehydration</td>
<td>5 (8.6)</td>
<td>3 (13.6)</td>
</tr>
</tbody>
</table>
DISCUSSION

In this study, male sex predominated. However, no evidence has been found that rotavirus infection occurs in a specific gender. Literature studies of the 41 articles published by Parashar concluded that the spread of rotavirus is different from the spread of bacteria or parasites enteropathogens, which is mainly through contaminated food or drink (Parashar et al 2006). Rotavirus is transmitted directly from person to person (person to person transmission).

The pattern of the patient’s age due to diarrhea by rotavirus infections generally occur in the first two years of a child’s lifetime (Parashar et al 1998). The subjects of the study who were infected by rotavirus are mostly under the age of 24 months (89.6%), and only 10.3% over the age of 24 months. There are 8 children (13.8%) of the study subjects who were infected by rotavirus at the age of 1-5 months. In the period under age 6 months, babies should still have antibodies against rotavirus obtained from his mother while still in the womb or through breast milk obtained (Ramachandran et al 1998). Therefore, this study did not examine antibody owned by the subjects in this group, then the suspected subjects in this group were infected with rotavirus by different G types of rotavirus G type antibodies they receive from his mother (Velázquez et al 1996) or by rotavirus with different types of P-type P rotavirus antibodies they receive from their mother (Ramachandran et al 1998). This is caused by rotavirus infection classified as homotypic protection. As the results of a cohort study by Velázquez et al (1996) in 200 Mexican infants followed until the age of 2 years it was found that in this period only 4% experienced a second rotavirus infection. (Velázquez et al 1996). After 3 years of age children rarely suffer severe rotavirus gastroenteritis. This is suspected to be the influence of active immunity by repeated infections throughout life (Lundgren & Svensson 2001).

In this study, 77.5% of subjects there were breastfed or ever breastfed, the length of breastfeeding in the group of rotavirus diarrhea patients was < 6 months (67.2%). Breastfeeding either exclusively or partially within the first 6 months prevent infection in the first few months of life. Infants less than 3 months rarely suffer from rotavirus diarrhea, allegedly associated with maternal antibodies against rotavirus which were channeled through the placenta and breast milk. Besides, Lactadherin in breast milk acts by unknown mechanism interferes with rotavirus replication process (Widowati et al 2012).

Accompanying clinical symptoms of rotavirus infection besides diarrhea in this study subjects are vomiting, fever, cough/cold with mild to severe dehydration. Vomiting symptoms is a common symptom which accompanies rotavirus infections (Parashar et al 2006). Symptoms of dehydration that accompanies the subject of this research is the common cause of hospitalization. Fever is present in 81% of subjects and respiratory symptoms (cough/cold) in 29.3% cases. Clinical symptoms of rotavirus diarrhea does have a broad spectrum from mild to severe and even fatal. Clinical presentation is also influenced by the age, at which the first infection after the first 3 months of life usually have a more severe clinical symptoms (Bernstein 2009). In addition, the severity of rotavirus diarrhea was also influenced by the strain (genotype and serotype) of the infected rotavirus. In Dr. Soetomo Hospital, rotavirus genotype combinations (at which GP type is not common) cause a higher degree of severity than the GP common genotype (Wardana 2014).

| Table 4. Accuracy of immunochromatography diagnostic tests in the diagnosis of rotavirus diarrhea

<table>
<thead>
<tr>
<th>Variables</th>
<th>Value</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>77.6%</td>
<td>64.4 – 87.1</td>
</tr>
<tr>
<td>Specificity</td>
<td>63.6%</td>
<td>40.8 – 82.0</td>
</tr>
<tr>
<td>Positive predictive value</td>
<td>84.9%</td>
<td>71.9 – 92.8</td>
</tr>
<tr>
<td>Negative predictive value</td>
<td>51.9%</td>
<td>32.4 – 70.8</td>
</tr>
<tr>
<td>Positive likelihood ratio</td>
<td>2.13</td>
<td>1.21 – 3.77</td>
</tr>
<tr>
<td>Negative likelihood ratio</td>
<td>0.35</td>
<td>0.20 – 0.63</td>
</tr>
<tr>
<td>Kappa test</td>
<td>P &lt; 0.0001</td>
<td>K 0.385</td>
</tr>
<tr>
<td>McNemar test</td>
<td>0.383</td>
<td></td>
</tr>
</tbody>
</table>
There have been a number of diagnostic methods used to diagnose rotavirus diarrhea. RT-PCR that became the gold standard has been widely carried out in the laboratory with complete facilities. However, this method is expensive, and expertise is needed.

The basic principle of doing a diagnostic study is the benefit gained from the latest methods than the old method. Such benefits are not always in the form of better diagnostic value, but also other advantages, among others: the diagnostic value that is not too different, non-invasive method, more simple or easy process, as well as a more affordable cost (Satroasamoro & Ismael 2011). Diagnostic methods were examined in this study, it was expected to have advantages as mentioned above.

One of the objectives of the development of diagnostic studies, among others, is to rule out the diagnosis of disease or illness. A diagnostic examination is said to have high accuracy when the resulting diagnostic parameters also have a high rate (Dahlan 2009). Parameter in question is the sensitivity, specificity, NPP, NPN and LH. Of the 80 subjects studied, showed that immunochromatography method has good diagnostic accuracy, the sensitivity 77.6%, specificity 63.6%, PPV 84.9% and NPV 51.85%.

Sensitivity is proportion ill subjects with a positive diagnostic test result (true positive) than the entire diseased subjects (true positive + negative pseudo) or the likelihood that a positive diagnostic test results when performed on a group of subjects who are sick. While specificity is the proportion of healthy subjects who give a negative diagnostic test result (true negative) compared to all subjects who are not sick (true negative + pseudo positive) or the possibility that the results of the diagnostic test will be negative when performed on a group of healthy subjects (Satroasamoro & Ismael 2011). In this study, a sensitivity of 77.6% means that 77.6% among subjects with diarrhea rotavirus can be detected with a immunochromatography test. Whereas in this study, the specificity of 63.6%, which means rotavirus diarrhea can be removed at 63.6% non-rotavirus diarrhea by using immunochromatography test. Thus this test is good enough to diagnose rotavirus diarrhea even if the result is negative cannot rule out the possibility of non-rotavirus diarrhea. This difference in accuracy can be caused by differences in strains of rotavirus in various countries.

In a previous study, Wilhelmi et al (2001) compare the performance characteristics of immunochromatography with RT-PCR as the gold standard. The evaluation was conducted on 228 stool specimens of children who have acute diarrhea in Spain using ROTA immunochromatography test-strip (Coris Bio Concept, Belgium) which detect group A rotavirus VP6 antigen result shows a sensitivity of 99%; specificity of 96%; The positive predictive value of 92%; and negative predictive value of 99% (Wilhelmi et al 2001). Accuracy is very good test in Spain due to rotavirus genotypes in Spain dominated type G namely G9 (50.6%), followed by G3 (33%) and G1 (20.2%) were classified as group A rotavirus (Sánchez-Fauquier et al 2006).

However, in another study, Manjula (2013) compare immunochromatography with RT-PCR as the gold standard in the 100 feacal children under 2 years old suffering from diarrhea in India and found the sensitivity and specificity were lower at 53.1% and 100%. Accuracy of this method is less well in India. It can happen because of a systematic review of 33 studies in India concluded that the genotypes of rotavirus in India are the most common type G (G [1] and G [4]) and type P (P [4] and P [8]) were classified as group A rotavirus and non-group A (Milesa et al 2012).

Nguyen in Vietnam compare immunochromatography dipstick method ‘Eiken’ Rota stick (SA Scientific, Texas, USA) with RT-PCR in 104 stool diarrhea children that can detect group A rotavirus results showed sensitivity of 87.8% and specificity of 93.3% (Nguyen et al 2007). Immunochromatography has good accuracy in Vietnam because of the strain of rotavirus there mainly dominated type G G2 (53%) followed by G4 (17%), G1 (13%) and G3 (3.6%) were classified as group A rotavirus (Nguyen et al 2001).

In everyday practice, predictive values (mainly positive) is the most important statistic in diagnostic research. NPP is the probability of a person suffering from the disease when positive diagnostic test results. While NPN is the probability of a person not suffering from the disease if the test result is negative. For clinicians, the NPP and NPN has more significance than the sensitivity and specificity for the clinician must be able to interpret the results of the examination has been carried out (Dahlan 2009). High predictive value in this study indicate that the possibility of the subjects actually suffered from diarrhea rotavirus positive immunochromatography when test results are quite large (84.9%).

However, the value of the NPP and NPN were influenced by the prevalence of the disease. Therefore we need a diagnostic parameter that is not influenced by the prevalence. Parameters that are not affected by the prevalence is LH (Dahlan 2009). LH declare the possibility of diseased subjects will receive a specific diagnostic test results divided by the possibility
of the subject is not sick will get the same test results. The greater the value of LH (positive) indicates the greater the separate examination and painless sore subject. Value LH (positive) that are considered important are 10 or more and LH (negative) under 0.1 (Satroasmoro & Ismael 2011). From the above explanation can be concluded that immunochromatography method cannot be used as the sole diagnostic tool for the detection of rotavirus diarrhea. If the negative result cannot rule out the diagnosis of rotavirus diarrhea, however the positive result can make the subject suffering from rotavirus diarrhea.

One way to assess the reliability of dichotomous nominal scale measurement that is widely used is the determination of the value of kappa (K). This value is expressed conformity measurements taken two or measurement methods can also measure the consistency between the two measurement tools. Ideal kappa value is 1, but this is hardly ever obtained. A value above 0.8 is usually considered to be very good (Satroasmoro & Ismael 2011). In this study, the obtained value of p 0.0001 and K 0.385 means there is a match between the test results of immunochromatography method with the RT-PCR method or no chance of replacing immunochromatography RT-PCR.

Apparent negative results can be caused by several factors, among others, because of the concentration of low levels of rotavirus samples that cannot be detected by the kit especially VP6 proteins in rotavirus antigen (Nguyen et al 2007). Immunochromatography based testing tool to detect specific RNA viruses require 2x10 5- 5x10 7 PFU/ml (Peruski & Peruski 2003). In addition, the apparent negative results may also be due to differences in rotavirus serotypes and genotypes. Limitations of test equipment with rotavirus immunochromatography method on the market today (including test equipment used in this study) is only able to detect group A rotavirus (G1, G2, G3, G4 and G9) (Wilhelm et al 2001). In Dr. Soetomo Hospital, Oktavian discover the diversity of rotavirus genotypes are 7 common genotype variations, and 25 general genotypic variations. Common genotype G2P[4] (19.3%) and uncommon genotype G1P[4] (4.5%) and G9P[4] (4.6%) were genotype with the highest prevalence in each group. In general genotype group, G1P[8] (11.4%) and G1P[6] (12.5%) is the second highest genotypes with similar prevalence. Genotype G3P[6] and G4P[6] respectively are found only 2 cases. In genotype groups not common, G4G9P[8] (3.4%) is the second highest genotype (Wardana 2014). The big difference in genotypes and serotypes of rotavirus in each country makes the difference antigen contained in each strain, so the antibody responses that occur will also be different. This causes no reaction of antibodies in the tool when exposed to the antigen of research subjects, so as to give a negative result in actual patients suffering from rotavirus diarrhea. Other things that can cause apparent negative results is because this test is qualitative and depends on the ability of clinicians who conduct the assessments. Rotavirus positive results in the assessment appears when the control line (green) and the red line in the area of reading test is highly dependent on what can be seen by the human eye (Peruski & Peruski 2003).

Apparent positive results can be caused by several factors. One such factor is the antibody cross-reaction test equipment immunochromatography with other viruses in the family reoviridae which have structurally similar proteins with rotavirus. The presence of blood in the stool can also lead to an apparent positive outcome. In addition, the apparent positive results were also found in infants who had received previous rotavirus vaccine (Ye et al 2013). However, in this study it has been excluded in the study sample.

From this study it can be concluded that the immunochromatography method shows a fairly good accuracy as a diagnostic tool for rotavirus diarrhea. An immunochromatography positive test results can be used as the basis of therapy in symptomatic subjects, especially in areas with limited diagnostic facilities because this method is quite accurate, less expensive, easy to do, fast, easy storage and not invasive. However, this diagnostic tool can only detect rotavirus antigens qualitatively. Further research involving greater number of subjects, wider area coverage and the use of test equipment for immunochromatography with group A rotavirus strains and non-group A should be developed at a later date to get a better accuracy.

**CONCLUSION**

Immunochromatography examination shows a good accuracy to detect rotavirus infection, so that it can be used as an alternative diagnostic method for rotavirus diarrhea in children. Further research using rotavirus strains that exist in our country needs to be done to get a better diagnostic value.

**REFERENCES**


Dahlan MS (2009). Penelitian Diagnostik, Jakarta, Salemba Medika

Immunochromatography Method for Rotavirus Detection Provides Good Accuracy (Sherly Yuniarchan et al)