Short Communication

Full Microscopic Examination (FEME), pH and Urinary Specific Gravity of Vegetarians and Non-vegetarians

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Abstract
Urinary examinations were determined in 162 individuals (62 young non-vegetarians, 24 elderly non-vegetarians, 40 young vegetarians and 36 elderly vegetarians). The examination consisted of full microscopic examination (FEME), pH and specific gravity. The most common urine sediments found in vegetarians and non-vegetarians were hyaline cast, granular cast, squamous epithelial cells and the oxalate crystals. Sediments of hyaline cast were significantly higher in vegetarians (p<0.05). While no significant difference was observed between urine sediments of granular cast, squamous epithelial cells, oxalate crystals and triple phosphate crystals in both groups. The most common urinary pH detected in vegetarians and non-vegetarians were in the range of pH 6 to pH 7. The majority of the vegetarians had urinary pH values of 7 while the majority of the non-vegetarians had urinary pH values of 6 (p>0.05). There was no significant difference in urinary pH between the young and elderly individuals in both groups. The common specific gravity ranges detected in the vegetarians were from 1.001 to 1.010 and 1.0201 to 1.030, while the common range detected in the non-vegetarians was 1.001 to 1.010. No significant difference was observed for urinary specific gravity between vegetarians and non-vegetarians as well as between the young and elderly individuals in both groups (p>0.05). In conclusion, no significant differences were seen between vegetarian and non-vegetarian individuals in urinary pH, specific gravity and all urinary sediments except hyaline cast.

Keywords: Urinary amino acids, vegetarians and non-vegetarians.

Introduction
All individuals are susceptible to urinary tract infection. Therefore preventive measures had been created since the last decade. Rapid screening test for urine had been evaluated, with each more rapid and simpler than before.

Urinalysis is a physical and/or chemical examination of the urine. It consists of chemical and microscopic tests to screen for urinary tract infections, renal (kidney) disease, and diseases of other organs that result in the appearance of abnormal metabolites (break-down products) in the urine. Urinalysis can reveal diseases that have gone unnoticed because they do not produce striking signs or symptoms. Examples include diabetes mellitus, various forms of glomerulonephritis, and chronic urinary tract infections [1].

All routine urinalysis should begin with a physical examination of the urine sample where urine sediment will be examined. Examination of urinary sediment provides a direct sampling of urinary tract morphology; it provides important information useful for both diagnosis and prognosis.

Microscopic examination of urine sediment is usually performed in addition to routine procedures. Accurate measurement of urine concentration can be done using a test called specific gravity that measures the amount of dissolved substances in the urine water. A vegetarian is a person who does not eat meat, fish or fowl or products containing these foods. The eating patterns of vegetarians may vary considerably. The lacto-ovo vegetarian diet is based on grains, vegetables, fruits, legumes, seeds, nuts, dairy products and eggs but excludes meat, fish, and fowl. The lacto-vegetarian excludes eggs as well as meat, fish, and fowl. The vegan, or total vegetarian, eating pattern is similar to the lacto-vegetarian pattern, with the additional exclusion of dairy and other animal products [2]. Even within these patterns, considerable variation may exist due to the extent that animal products are avoided [3].

The purpose of this study is to characterize and identify the urinary sediments of vegetarians and non-vegetarians.

Material and Methods
Sampling
The total number of subjects studied was 162 with 102 young volunteers and 60 elderly volunteers. In the present study, young individuals were between 15 - 45 years old while elderly individuals were between 46 - 70 years old. There were 62 young individuals and 24
elderly individuals who were on a normal diet. In the vegetarian group, there were 40 young individuals and 36 elderly individuals (Figure 1). Of the vegetarians, 33 were lacto-ovo volunteers, 19 lacto volunteers and 24 vegan volunteers. There were 46 female volunteers and 40 male volunteers on normal diet, while there were 34 female volunteers and 42 male volunteers on vegetarian diet.

24 hour urine was collected in a clean plastic bottle with toluene as preservative [4]. All participants were in good nutritional states and consuming their usual food; no special precautions were taken regarding drug therapy during the time of sample collections. Collected urine samples were frozen at -20°C until assayed, usually within 2 weeks.

Specific gravity and pH
The specific gravity was measured with a hydrometer. A volume of 1 liter was used as a standard measurement. Urinary pH was measured by using pH paper.

Full microscopic Examination (FEME)
1ml of the urine sample was pipetted into a centrifuge tube. The tube was centrifuged for 5 min at 13.2 x 10^3 rpm at room temperature. The supernatant was poured off and the sediment was resuspended with the remaining urine in the tube.

20µL was taken and placed onto a glass slide. A coverslip was placed over the urine sediment suspension. The sediments were scanned under 40X magnification. Observations were done and recorded. The average numbers of sediments were reported based on the reported normal range [5].

Statistical Analysis
Statistical analysis was done by student’s t-test and chi-square. A p-value of ≤ 0.05 was considered significant.

Results
As seen in Figure 2, the most common urine sediments found in vegetarians and non-vegetarians are hyaline cast, granular cast, squamous epithelial cells and the oxalate crystals. Sediments of hyaline cast were significantly higher in vegetarians (p<0.05) while no significant difference was observed between urine sediments of granular cast, squamous epithelial cells, oxalate crystals and triple phosphate crystals in both groups (Table 1). The majority of bacteria cells were found in the vegetarian urines.

### Table 1: Frequency of urinary sediments in vegetarians and non-vegetarians.

<table>
<thead>
<tr>
<th></th>
<th>Granular cast</th>
<th>Hyaline cast</th>
<th>Squamous epithelial cells</th>
<th>Oxalate crystals</th>
<th>Triple phosphate crystals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% frequency</td>
<td>p-value</td>
<td>% frequency</td>
<td>p-value</td>
<td>% frequency</td>
</tr>
<tr>
<td>vegetarian</td>
<td>7</td>
<td>0.096</td>
<td>4</td>
<td>0.02*</td>
<td>49</td>
</tr>
<tr>
<td>non-vegetarian</td>
<td>41</td>
<td></td>
<td>50</td>
<td>0.996</td>
<td>48</td>
</tr>
</tbody>
</table>

* denotes significance (p<0.05)

Percentage detection frequency = Presences of urinary sediments in a group x 100%

Presences of urinary sediments in a group

Total samples in a group
The most common urinary pH detected in vegetarians and non-vegetarians were in the range of pH 6 to pH 7. The majority of the vegetarians had urinary pH values of 7 while the majority of the non-vegetarians had urinary pH values of 6 (p>0.05) (Table 2).

The common specific gravity ranges detected in the vegetarians were from 1.001 to 1.010 and 1.0201 to 1.030, while the common range detected in the non-vegetarians was 1.001 to 1.010. No significant difference was observed for urinary specific gravity between vegetarians and non-vegetarians (p>0.05) (Table 3).

<table>
<thead>
<tr>
<th>pH</th>
<th>Vegetarian (% frequency)</th>
<th>Non-vegetarian (% frequency)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>0</td>
<td>5</td>
<td>0.685</td>
</tr>
<tr>
<td>6</td>
<td>33</td>
<td>47</td>
<td>0.98</td>
</tr>
<tr>
<td>7</td>
<td>51</td>
<td>41</td>
<td>0.995</td>
</tr>
<tr>
<td>8</td>
<td>14</td>
<td>7</td>
<td>0.882</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>1</td>
<td>0.818</td>
</tr>
</tbody>
</table>

Table 2: Frequency of urinary pH in vegetarians and non-vegetarians

<table>
<thead>
<tr>
<th>Specific gravity</th>
<th>Vegetarian (% frequency)</th>
<th>Non-vegetarian (% frequency)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.001 - 1.0100</td>
<td>45</td>
<td>48</td>
<td>0.999</td>
</tr>
<tr>
<td>1.0101 - 1.0200</td>
<td>5</td>
<td>22</td>
<td>0.473</td>
</tr>
<tr>
<td>1.0201 - 1.0300</td>
<td>50</td>
<td>30</td>
<td>0.911</td>
</tr>
</tbody>
</table>

Table 3: Frequency of urinary specific gravity in vegetarians and non-vegetarians

Discussion

The most commonly found urine sediments were squamous epithelial cells and oxalate crystals. Casts are urinary sediments formed by coagulation of albuminous material in the kidney tubule. Casts in the urine always indicate some form of kidney disorder [6].

Hyaline casts are the most frequently occurring casts in urine and it was found mostly in non-vegetarian individuals. Hyaline casts can be seen in even the mildest renal disease. However, the presence of hyaline cast was detected in a low high power field (HPF- 100x) thus it was considered as normal in this study [6]. These casts are formed from precipitated protein and they have no pathological significance. They are found in normal urine especially after exercise or dehydration. Meanwhile, granular casts usually indicate significant renal disease but it may be present in the urine for a short time after strenuous exercise [6]. Granular cast detected was found in the young non-vegetarian individuals; thus indicating that it may be due to the physical activity of the individual throughout the day during sampling.

Normally in men and women, a few epithelial cells from the bladder (transitional epithelial cells) or from the external urethra (squamous epithelial cells) can be found in the urine sediment. Cells from the kidney (kidney cells) are less common. For example, a bladder infection will leave large amounts of transitional epithelial cells in urine sediment [7], while squamous epithelial cells represent a possible contamination of specimen with skin flora [6].

Many urine sediments contain crystals. The type of crystal present depends on urine pH, concentration of the crystal material, and urine temperature. Most crystals have no clinical significance, unless present in sufficient quantities to form urinary calculi. In this study, the majority of non-vegetarian and vegetarian individuals had oxalate crystals in their urine. However, the presences of crystals were at a low high power field; thus indicating that the presence is harmless [8].

In a healthy person, the urinary tract is sterile. There should be (no microorganisms) present in the urine. However, particularly in women, bacteria from surrounding skin can enter the urinary tract at the urethra and move up to the bladder, causing a urinary tract infection (UTI). If the infection is not treated, it can eventually move up into the kidneys and cause pyelonephritis [7].

Bacteria that were detected in the urine could be due to misinterpretation of air bubbles during detection. Therefore it is advisable to carry out a further test to vary them. For example the fixing and staining method could detect the rod and cocci shaped bacteria if they were found.

Urine may contain a wide variety of common artifacts especially if they are collected improperly or in dirty containers. If the artifacts are not properly recognized, misinterpretation can result. Some of the common artifacts include fibers, oil droplets, starch, talc, hair and pollen. Many kinds of fibers such as hair and fabric threads
Urinary analysis of vegetarians and non-vegetarians

appear in the urine. Because fibers and hair are a contaminant they are usually not noted. Thus the presence of fibers in this study denote contamination during sample collection.

In women (and rarely in men), yeast can also be present in urine. They are most often present in women who have vaginal yeast infection, because the urine has been contaminated with vaginal secretions during collection [7].

As for the red blood cells, they are usually not present in normal urine. However, it was observed in a few urine samples and it might be due to samples taken within a short period after menstruation. As for the presence of white blood cells in the urine samples, the presence of less than 3 cells per high power field was considered as normal. The number of white blood cells (WBC)s in urine sediment is normally low. However, when the number is high, it indicates an infection or inflammation somewhere in the urinary tract [7].

Specific gravity measures the urine density or the ability of the kidney to concentrate or dilute urine over plasma. The normal values are 1.002 to 1.028 [9]. The common range detected in the vegetarians are 1.001 to 1.010 and 1.0201 to 1.030, while the common range detected in the non-vegetarians are 1.001 to 1.010. The reason is not clear to why it is so but the detected range falls within the normal values.

Urine pH is used to classify urine as either a dilute acid or base solution. The glomerular filtrate is usually acidified by the kidneys from a pH of approximately 7.4 to a pH of about 6 in the urine. Depending on the person’s acid-base status, urinary pH range from 4.5 to 8. The kidneys maintain normal acid-base balance primarily through the re-absorption of sodium and the tubular secretion of hydrogen and ammonium ions. Secretion of acid or alkaline urine by the kidneys is one of the most important mechanisms the body uses to maintain a constant body pH [10].

In people who are not vegetarians, the urinary pH tends to be acidic. This could be due to the consumption of meat proteins because they can cause an increase of uric acid in urine thus making urine more acidic [11]. Vegetarians were found to have a higher pH value compared to non-vegetarians. This could be due to a diet rich in citrus fruits, legumes, and vegetables which could raised the pH and produces urine that is more alkaline.

In conclusion, no significant differences were seen between vegetarian and non-vegetarian individuals with respect to urinary pH, specific gravity and all urinary sediments except hyaline cast.

Acknowledgements
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References