



Global Advanced Research Journal of Medicine and Medical Science (ISSN: 2315-5159) Vol. 4(7) pp. 301-307, July, 2015  
 Available online <http://garj.org/garjmms>  
 Copyright © 2015 Global Advanced Research Journals

## *Full Length Research Paper*

# **Water Consumption Pattern Profile and Dehydration Level on Elderly Living in Low Level Land and High Level Land**

**Rusilanti, Ari Istiany and Nur Riska**

Home Economics Department, State University of Jakarta

Accepted 26 January, 2015

This research purpose was to analyze water consumption profile pattern and dehydration level on elderly living in low level land and high level land. The method was used a survey method with cross sectional design. This research was held at Dadap Sub District as low level land (LLL) and at Lembang Sub District as high level land (HLL). This research was taken place on April until November 2013. The samples of this research were the 120 elderly people whose aged 60-70 years old, with each location was 60 people. The sampling technique was done by simple random sampling. Water consumption pattern data were collected by using a questionnaire with interview techniques and a 24 hours food recall method. Meanwhile, the level of dehydration were collected by using urine color indicator test levels. To determine differences in water consumption patterns and levels of dehydration between the LLL and HLL used U Mann Whitney test. The results was above 50% elderly in both places were consumption of water 5-8 glasses/day. There were 75 % elderly in LLL and 31.67% in HLL suffer moderate dehydration. Meanwhile, 5 % elderly in LLL and 33.3% in HLL suffer severe dehydration. The conclusion of this research were there were n't difference of the water consumption patterns and the dehydration level on elderly living in LLL and HLL.

**Keywords:** Water Consumption, Dehydration, Elderly, Living in Low Level Land and Living in High Level Land

## **INTRODUCTION**

Advanced age was the last growth stages of human growth cycle that marked a change in physical and psychological decreased. Physiological changing in elderly due to ability of homeostasis decreased (the body's dynamic equilibrium) and in the thirst response decreased to hypovolemic conditions and hiperosmolarity conditions.

Hiperosmolarity and hypovolemic condition were condition that occurred due to lack of body fluids and

sodium that caused water intake did not balance with water released in the body, causing bleeding and diarrhea. Water was a very important thing for human life and its function could not be replaced with other compounds. The human body needs water to live healthy and active. Water was essential for good health, the water needs in each individual is different, the water needs depends on many factors, include health, strenuous activity and the area of residence. In some studies have produced varying recommendations, including the results of research from the Institute of Medicine recommends for adult men consume about 3 liters of water / day and for women about 2.2 liters / day.

---

\*Corresponding Author E-mail: [rusilanti@gmail.com](mailto:rusilanti@gmail.com)

In Indonesia there was a message from the Ministry of Health on the advice of drinking water, which is at least 2 liters (8 cups)/day.

When the chemical composition of human body life was analyzed, it would be seen that the water average content of 65% or about 47 liters per adult. Each day approximately 2.5 liters of water should be replaced with new one. Estimated from the amount of water that must be replaced 1.5 liter came from drinking water and about 1.0 liters came from food consume. People who lived in hot (high temperature) and low humidity had loss of body fluids increasing through the electrolyte and perspiration.

Lembang is a region with a low temperature caused the cold air. The cold air can make residents reduce water consumption. People who live in high level lands, certainly not as sharp as his thirst for the people who live in the low level lands, so the awareness to consume less water. In fact, the body continues to secrete fluid that remains to be replaced. Thus the new problems that may arise a problem of dehydration in the local population due to the influence of the neighborhood. This is possible because the water intake on the body is not balanced with the output of water and used for other activities.

Inability to water needs in body, because they either are not able to or do not know, can cause dehydration. Dehydration occurs on elderly are particularly vulnerable because of the sensitivity of the thirst center is reduced in the elderly. Research in Singapore shows a group of elderly (> 60 years) mostly elderly women only drinks 3-5 glasses of water and drink 4-6 glasses of elderly men per day. Dehydration is a disruption on the fluids balanced body. This happened because the water was spending more than income (such as drinking). Besides disturbing the balance of the body, at the level that has been very severe, dehydration can also lead to loss of consciousness, coma, until death.

Thus, water has important role for the body, water level consumption was obtained from the pattern of eating and drinking consumption. Especially for the elderly who has physiology changes, dehydration could not be avoided. In this case, the appropriate level of water consumption with body intake will avoid long dehydration for elderly. With these facts, the researcher will analyze the ratio level dehydration in two different places from location, terrain, temperature, climate and demography in Dadap and Lembang Sub District. It was very necessary to get important attention on elderly of water consumption pattern and dehydration level. Thus, wider impact from dehydration can be early prevented. The result of this study was aimed to analyze the profile of water consumption and dehydration level of elderly who lived in high and low level lands.

## METHODS

This study was conducted at two different locations in Dadap Sub District as low level land (LLL) and Lembang Sub District as high level land (HLL). The study took place in April to November 2013. Research method was used survey method using cross-sectional design. Samples of this research were 120 elderly people who aged 60-74 years old, each location was 60 people. The sampling technique was done by simple random sampling.

The data which had collected were consisted of sample characteristics (age, education level, gender, marital status, occupation, income level), water consumption and dehydration level. Water consumption pattern

data were collected by using a questionnaire with interview technique and 24-hours food recall method to analyze water consumption sourcing from food. Armstrong et al. (1998) in his research on dehydration status stating that the color of urine can be used as an indicator to determine the status of a person in a practical dehydration. Research conducted Armstrong, et al. implementation procedures urine tests conducted on until the small of urine into a clear container. Samples are usually collected evenings. Samples must be held in front of a white background, in good light, and color compared to the color chart. Dehydration level data was tested by urine color indication test on PURI card. Level dehydration was divided into three types such normal dehydration (scale 1-2), mild dehydration (scale 3-4), moderate dehydration (scale 5-6) and severe dehydration (scale 7-8)

Data processing was done using software SPSS (Statistical Program for Social Studies) version 17.0 and using Microsoft Excel 2007. The processing process included editing, coding, entry and analysis. All data would be analyze with descriptive analyze to find out mean, deviation standard and frequency and using statistical calculation. To analyze differences in water consumption pattern and dehydration level between the low level land and high level land used U Mann Whitney test.

## RESULTS AND DISCUSSION

### A. Characteristic Respondent

#### A.1. Age of Respondent

Respondents in this study were elderly who were in age range of 60-74 years old. Based on Table 1, known that elderly who aged 60-65 years in LLL were 73.33%, while in HLL were 50%; 66-70 years-old elderly in LLL were 20%, while in HLL were 23.3%, and

**Table 1.** Data of Elderly Age

Age Classification (years)	LLL		HLL	
	n	%	n	%
60–65	44	73.33	30	50
66–70	12	20	14	23.3
71–74	4	6.67	16	26.67
<b>Total</b>	<b>60</b>	<b>100</b>	<b>60</b>	<b>100</b>

elderly who aged 71-74 years in LLL were 6.67%, while in HLL were 26.67%.

## A.2. Education Level of Respondent

Based on Table.2. were known that there were 75% elderly in LLL and 36.67% elderly in HLL who no school. Elementary school in LLL were 25% and in HLL 33.33%. There weren't elderly who at junior, senior high school and university in LLL. While, in HLL were 18.33%, 10%, and 1.67% the elderly who at junior, senior high school and university.

**Table 2.** Data of Education Level

Education Level	LLL		HLL	
	n	%	n	%
No School	45	75	22	36.67
Elementary	15	25	20	33.33
Junior High	0	0	11	18.33
Senior High	0	0	6	10
University	0	0	1	1.67
<b>Total</b>	<b>60</b>	<b>100</b>	<b>60</b>	<b>100</b>

## A.3. Gender of Respondent

Based on table 3 were known that male elderly were 10% in LLL and 21.67% in HLL. While, female elderly were 90% in LLL and 78.33% in HLL.

**Table 3.** Data of Elderly Gender

Gender	LLL		HLL	
	n	%	n	%
Male	6	10	13	21.67
Female	54	90	47	78.33
<b>Total</b>	<b>60</b>	<b>100</b>	<b>60</b>	<b>100</b>

## A.4. Job of Respondents

Based on table 4 were known that most elderly in LLL and HLL as a house wives. The others job of elderly in

LLL as labor, fisherman, private employee, businessman/women and services.

**Table 4.** Data of Elderly Job

Job Classification	LLL		HLL	
	n	%	n	%
Labor	8	13.33	0	0
Fisherman	4	6.67	0	0
Private Employee	1	1.67	1	1.67
Businessman/ women services	6	10	4	3.33
House wives	9	15	0	0
others	25	41.67	42	58.33
<b>Total</b>	<b>60</b>	<b>100</b>	<b>60</b>	<b>100</b>

## A.5. Income Level of Respondent

Based on Table 5 were known that 46.67% the elderly who have no family income in LLL and 36.67% in HLL. The other fact, elderly who have family income < Rp. 1,000,000 in LLL were 41.67% and 45% in HLL.

**Table 5.** Data of Elderly Income

Income Classification	LLL		HLL	
	n	%	n	%
Moneyless	25	46.67	22	36.67
< Rp 1.000.000	28	41.67	27	45
Rp 1.000.000 – Rp 2.000.00	7	11.67	5	8.33
> Rp 2.000.000	0	0	6	10
<b>Total</b>	<b>60</b>	<b>100</b>	<b>60</b>	<b>100</b>

## B. Water and Food Consumption Patterns

### B.1 Water Consumption

#### B.1.1 Data of Water Likes

Coffee were dominated as favorite drink as water consumption on elderly in LLL 38.33%, tea were 31.67%, water were 15% and the others drink were 15% such as milk, juices, nectar, isotonic water etc. The highest percentage of the beverages were coffee because of the elderly reason that coffee was a sleepless drink during activities and a drink that became routine morning drink. While in HLL the water consumption habits of the elderly dominate water were 70%, tea were 26.67%, and other such as milk, herbs, juices, nectar, isotonic, herbs and so much were 3.33%. The highest Percentage of favorite drink in water can be seen in Table 6.

**Table 6.** Data of Elderly Favorite drinks

Favorite Drink	LLL		HLL	
	n	%	n	%
Coffee	23	38.33	0	0
Tea	19	31.67	16	26.67
Drinking Water	9	15	42	70
Others (milk,juices, traditional beverages,nectar, isotonic,	9	15	2	3.33
<b>Total</b>	<b>60</b>	<b>100</b>	<b>60</b>	<b>100</b>

**B.1.2. The Number of Water Consumption**

Based on table 7 shown that water amount consumption 7-8 glasses of water a day in LLL were 31.6% while in HLL were 21.67%. 5-6 glasses of water a day in LLL were 25% and in HLL were 35%. 4-3 glasses of water a day in LLL were 35% while in HLL were 26.67%. 1-2 glasses of water in LLL were 8.33% while in HLL were 16.67%. Based on WKNPG (2008) water needs for the elderly (>60 years old) men as much as 1.5 liters / day (6 glasses/day) and women 1 liters / day (4 glasses/day).

**Table 7.** Data of Water Consumption

Frequency of Water Consumption (Glasses/day)	LLL		HLL	
	n	%	n	%
7-8	19	31.67	13	21.67
5-6	15	25	21	35
4-3	21	35	16	26.67
1-2	5	8.33	10	16.67
Never	0	0	0	0
<b>Total</b>	<b>60</b>	<b>100</b>	<b>60</b>	<b>100</b>

**B.1.3. Water Consumption Sources**

In Table 8. known that sources of water consumed were derived from springs in LLL were 20%, while in HLL were 28.33%. There were no a well- from in LLL while in HLL were 60 %, derived from taps/PDAM in LLL were 73.33%, while in HLL were 8.33%. There were no rain water consumed in LLL, while in HLL were 3.33%.

**Table 8.** Data of Water Sources

Water Sources	LLL		HLL	
	n	%	n	%
Springs	12	20	17	28.33
Well	0	0	36	60
PDAM	44	44	5	8.33
Rain water	0	0	2	3.33
Others	4	6.67	0	0
<b>Total</b>	<b>60</b>	<b>100</b>	<b>60</b>	<b>100</b>

**B.1.4. Frequency of Drinking While Working or Doing Activities**

Based on Table 9 known that frequency of drinking while working or doing activities were very often in LLL were 11.67%, while in HLL were 13.33%, often in LLL were 13.33%, while in HLL were 20%. For sometimes category in LLL were 41.67%, while in HLL were 21.67%, seldom in LLL were 31.67%, while in HLL were 45%, and never in LLL were 1.67%. Water consumed during exercise is useful to minimize the risk of muscle spasms. If we are in the area or place where the temperature is hot, then our body will need adequate water. On a hot place like that, the body will respond by secreting sweat to normalize body temperature (Almatsier, 2009).

**Table 9.** Data of Frequency of Drinking While Working

Frequency	LLL		HLL	
	n	%	n	%
Very often (>6 times)	7	11.67	8	13.33
Often (5-6 times)	8	13.33	12	20
Sometimes (3-4 times)	25	41.67	13	21.67
Seldom (1-2 times)	19	31.67	27	45
Never	1	1.67	0	0
<b>Total</b>	<b>60</b>	<b>100</b>	<b>60</b>	<b>100</b>

**B.2. Food Consumption Habits****B.2.1. Frequency of Fruit Consumption**

Based on Table 10. Known that most of elderly in LLL were seldom and never for fruit consumption. While in HLL, for very often were 3.33%, often were

**Table 10.** Data of Fruit Consumption Frequency

Frequency	LLL		HLL	
	n	%	n	%
Very often (>6 times)	0	0	2	3.33
Often (5-6 times)	0	0	10	16.67
Sometimes (3-4 times)	4	6.67	9	15
Seldom (1-2 times)	13	21.67	35	58.33
Never	43	71.67	4	5.67
<b>Total</b>	<b>60</b>	<b>100</b>	<b>60</b>	<b>100</b>

16.67%, sometimes were 15%, seldom 58.33%, and never 5.67%.

### B.2.2. Frequency of Vegetables Consumption

Based on Table 11 known that most of elderly in LLL were seldom and never for vegetable consumption. While in HLL, for very often were 16.67%, often were 20%, sometimes were 35%, seldom 25%, and never 3.33%.

**Table 11.** Data of Vegetable Consumption Frequency

Frequency	LLL		HLL	
	n	%	n	%
Very often (>6 times)	0	0	10	16.67
Often (5-6 times)	4	6.67	12	20
Sometimes (3-4 times)	9	15	21	35
Seldom (1-2 times)	19	31.67	15	25
Never	28	46.67	2	3.33
<b>Total</b>	<b>60</b>	<b>100</b>	<b>60</b>	<b>100</b>

### B.2.3. Types of Food Processing

Based on Table 12. known that types of food processing such as boiled, sautéed and fried in LLL were 6.67%, 18.33% and 75%. While in HLL were 38.33%, 3.33%, and 51.67%.

**Table 12.** Data of Types of Food Processing

Food Processing	LLL		HLL	
	n	%	n	%
Boiled	4	6.67	23	38.33
Steamed	0	0	4	6.67
Sauteed	11	18.33	2	3.33
Baked	0	0	0	0
Fried	45	75	31	51.67
<b>Total</b>	<b>60</b>	<b>100</b>	<b>60</b>	<b>100</b>

### B.2.4. Water intake from food and beverage consumption

Average total water amount in food recall for 3 days had great variety which derived from beverages and food intake. The most water total intake derived from such as drinking water, coffee and tea. Water from food was average derived from rice, fish, vegetables (spinach, kale

and squash) and fruit such as pineapple, banana and zalaca palm. The water total intake of elderly man who aged 60-64 years old i.e. 2.300 ml and > 65 years old i.e. 1.500 ml. While the water total intake of elderly woman who aged 60-64 years old i.e. 2.000 ml and > 65 years old i.e. 1.500 ml. Water total was conversed of four levels i.e. level 1 (80-100%), level 2 (60-79%), level 3 (40-59%) and level 4 (<39%). For level 1 in LLL were 3.33% while there were no in HLL. Level 2 in LLL were 15% while in HLL were 10%, at level 3 in LLL were 75 %, while in HLL were 90 %, and level 4 in LLL were 6.67% while there weren't in HLL. Based on data in Table 13, it can be seen that the percentage of total water for 3 days at level 3 (40-59%) the highest. Yudianti (2011) research results indicate that the water consumption of the food in the elderly is a staple food (46%), side dishes (13%), fruit (17%) and vegetables (11%).

**Table 13.** Data of Water Intake from Food and Beverages Consumption

Classification	LLL		HLL	
	n	%	n	%
Level 1 (80-100%)	2	3.33	0	0
Level 2 (60-79%)	9	15	6	10
Level 3 (40-59%)	45	75	54	90
level 4 (<39%)	4	6.67	0	0
<b>Total</b>	<b>60</b>	<b>100</b>	<b>60</b>	<b>100</b>

## C. Dehydration Level

### C.1. Medical History

Medical history was a point about level dehydration because there were some diseases related to dehydration status such as hypertension, diabetes, obesity, kidney problems, diarrhea, constipation, urinary infection, etc. Based on the medical history data were achieved the average of respondent who had or suffered from that disease. Based on the diseases medical history data, hypertension in LLL were 28.33 %, while in HLL were 40 %, diarrhea in LLL were 38.33%, while in HLL were 3.33%, constipation in LLL were 13.33%, while in HLL were 13.33%, stroke in LLL were 3.33 %, while in HLL were 6.67%, and other diseases in LLL were 16.67%, while in HLL were 36.67%. Can be seen in Table 14. Based on medical history suffered disease data were dominated on hypertension due to the influence of food pattern was not as good as consuming foods that contain high levels of salt such as salted fish, using the generic medicines that affect high blood pressure and less water intake. According to Batmanghelidj (2007), essential hypertension is caused by dehydration are formed in the body continuously.

**Table 14.** Data of Suffered Diseases

Suffered Diseases	LLL		HLL	
	n	%	n	%
Hypertension	17	28.33	24	40
Diarrhea	23	38.33	2	3.33
Constipation	8	13.33	8	13.33
Stroke	2	3.33	4	6.67
Others	10	16.67	22	36.67
<b>Total</b>	<b>60</b>	<b>100</b>	<b>60</b>	<b>100</b>

**Table 15.** Data of Physical Signs of Dehydration

Physical Signs of Dehydration	LLL				HLL			
	Yes		No		Yes		No	
	n	%	n	%	n	%	n	%
<b>Light Dehydration</b>								
Severe thirsty	47	78.33	13	21.67	32	53.33	18	46.7
Fast tired	44	73.33	16	26.67	44	73.33	16	26.7
Dry skin	31	51.67	29	48.33	33	55	17	45
Dry lip	46	57.50	34	42.50	46	76.67	14	23.33
Dry throat	41	68.33	19	31.67	38	63.33	22	36.67
Dizziness	48	80	12	20	37	61.67	23	38.33
Weak	27	45	33	55	47	78.33	13	21.67
Muscle cramps	44	73.33	16	26.67	38	63.33	22	36.67
<b>Severe Dehydration</b>								
Vomiting and defecate	5	8.33	55	91.67	5	8.33	35	91.67
Spams	0	0	60	100	0	0	60	100
Faint	1	1.67	59	98.33	1	0.02	59	99.98

## C.2. Physical Signs of Dehydration

Data of dehydrated physical signs were taken from the respondents questionnaire. Data of dehydrated physical sign in LLL, on severe thirsty items showed were 78.33% and 21.67% did not. on easily tired showed that were 73.33 % got and 26.67% did not get. For dry skin items showed 41.67% got and 58.33 % did not get. On Dry lips items 51.67 % got and 48.33% on the contrary. On dry throat item were 68.33% and 31.67% on the contrary. On symptoms of dizziness item showed were 80 % got and 20 % on the contrary. Furthermore, the weak items were 45 % got and 55 % on the contrary. Then, on muscle cramps items were 73.33% with and 26.67 % on the contrary. On vomiting and continuously defecate items showed 8.33 % and 91.67 % on the contrary. For spasm items were 100 % did not get . On the last items that was faint only 1.67% who got and 98.33% did not get .

Data of dehydrated physical sign in HLL, on severe thirsty items showed 53.33% got and 46.67% did not. Fast tired showed that 73.33% got and 26.67% did not. For dry skin items showed 55% got and 45% and

did not. On Dry lips items got and 55% got and 45% did not. On dry throat item were 63.33% got and 36.67%

did not. On symptoms of dizziness item showed 61.67% got and 38.33% did not. Furthermore, the weak items were 78.3% and 21.67% did not. Then, on muscle cramps items 63.33% got and 38.33% did not. On vomiting and continuously defecate items showed 8.33% got and 91.67% did not. For spasm items were 100% did not get . On the last items that was faint only 0.02% got and 99.98% who did not. Can be seen on table 15.

## C.Urine Colour Measurement Scale

The urine colour scale were classified into four levels. Level 1 (scale 1-2) stated that respondent who suffered normal hydrated, level 2 (scale 3-4) stated that the respondent who suffered mild dehydration, level 3 (scale 5-6) stated that the respondent who suffered moderate dehydration, and level 4 (7 - 8) stated that the respondent who suffered from severe dehydration. For normal in LLL were 3.33 %, while in HLL were 15%, mild dehydration in LLL were 16.67%, while in HLL

**Table 16.** Data of Dehydration Level based on Urine Colour

Dehydration Classification	LLL		HLL	
	n	%	n	%
Normal	2	3.33	9	15
Mild	10	16.67	12	20
Moderate	45	75	19	31.67
Severe	3	5	20	33.33
<b>Total</b>	<b>60</b>	<b>100</b>	<b>60</b>	<b>100</b>

were 20%, moderate dehydration in LLL were 75% , while in HLL were 31.67%, and severe dehydration in LLL were 5%, while in HLL were 33.33%.

FIC (2000) states that thirst is a sign of someone being dehydrated. Batmanghelidj (2007) states that human water regulation depends on the sensation of thirst. But the sensation of thirst as understood to date (ie dry mouth) is not an accurate sign of actual water demand. If you do not feel thirsty, people tend not to drink the water. Typically, a person wait until thirsty before you start thinking of drinking water.

According to Rotikan (2003), in the elderly the factors that can lead to dehydration as a result of diabetes, kidney disorders, hypertension, and decrease the physiological decline thirst. Environmental factors namely shelter, temperature and humidity are also very influential on the level of dehydration.

#### D. Statistical Analysis of Test Results

Testing for normality in this study using Kolmogorof Smirnov test, indicated the population in LLL and HLL for water and food consumption patterns weren't normal distribution. The Homogeneity test showed a homogeneous population. Further, U Mann Whitney test indicated that there weren't difference in the water consumption patterns and the level of dehydration between LLL and HLL.

#### CONCLUSION

Data Results of elderly favorite drinks in LLL mostly from coffee and tea, while in HLL from water and tea. The elderly in LLL consumption of water, fruit and vegetable less than in HLL. There were 75 % elderly in LLL and 31.67% in HLL suffer moderate dehydration. Meanwhile, 5 % elderly in LLL and 33.3% in HLL suffer severe dehydration. The Calculation of significance value with U Mann Whitney test indicated that there weren't difference of the water consumption patterns and the dehydration level on elderly living in low level land (LLL) and high level land (HLL).

#### REFERENCES

- Almatsier S (2009). Prinsip Dasar Ilmu Gizi. Jakarta: Gramedia Pustaka Utama.
- Armstrong LE dkk (1998). Urinary Indices of Hydration Status. *Int J Sport Nutr* 1194:4(3):265-79.
- Anonim (2011). Penyebab Dehidrasi dan Cara Mengatasinya. Diunduh dari: <http://batch40.wordpress.com/2011/07/12/penyebab-dehidrasi-dan-cara-mengatasinya/>. Diakses: Maret 2013.
- Arikunto S (1998). Prosedur Penelitian. Jakarta: Bina Aksara.
- Asian Food Information Centra (AFIC) (2000). Fluid for Oldest. <http://www.AFIC.org>. [24 Maret 2013].
- Batmanghelidj F.(2007). Air untuk Menjaga Kesehatan & Menyembuhkan Penyakit. Jakarta: Gramedia.
- FAO and WHO. Food Categories. Diunduh dari: <http://www.codexalimentarius.net/gsfonline/food/index.html>. diakses:
- Mashaw (2008). Dehidrasi, Bahaya, Gejala, Pencegahan, dan Pengobatannya. <http://mashaw.wordpress.com/2008/12/01/dehidrasi-bahaya-gejala-pencegahan-dan-pengobatannya/>. [24Maret 2013].
- Rahma P (2009). Kebiasaan Minum Dan Kebutuhan Cairan Serta Kecenderungan Dehidrasi Siswa Sekolah Dasar. [Skripsi]. Departemen Gizi Masyarakat-IPB.
- Rotikan (2003). Dehidrasi, Mudah Menyerang dan Berbahaya. <http://www.kompas.com>. [24 Maret 2013].
- Widyakarya Nasional Pangan Dan Gizi (WKNPG) IX (2008). Hotel Bumi Karsa Bidakara Jakarta 26 - 27 Agustus 2008.
- Winarno FG (1992). Kimia Pangan dan Gizi. Jakarta: Gramedia.
- Yudianti Desi (2011). Analisis Asupan Air dan Mutu Gizi Asupan Pangan pada Lansia di Indonesia. [Skripsi]. Departemen Gizi Masyarakat-IPB.