



## The Correlation between Fat and Iron Intake with the Ability to Memorize the Qur'an in Female Students Aged 12-14 Years at Insan Mulia Boarding School (IMBOS) Pringsewu

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### ABSTRACT

**Background:** Adequate intake of fat and iron will improve santri' cognitive function which will have an impact on increasing their ability to memorize the Al-Qur'an. Fat intake can improve memory which will affect the ability to memorize. Iron functions to form oligodendrocyte cells and helps enzymes to produce the neurotransmitters serotonin, norepinephrine and dopamine which play a role in the memory process. This study aims to determine the relationship between fat and iron intake and the ability to memorize the Al-Qur'an in female santri aged 12-14 years at Insan Mulia Boarding School (IMBOS) Pringsewu.

**Research Methods:** The research method was carried out observationally with a cross sectional approach on 60 respondents. Intake data was obtained by weighing food Semi Quantitative Food Frequency Questionnaire (SQ-FFQ) as supporting data. Statistical analysis was conducted by Spearman Rank Test

**Research Result:** The results of the study showed that there was no relationship between fat intake ( $p=0.642$ ) and iron ( $p=0.835$ ) with the ability to memorize the Al-Quran in female santri aged 12-14 years at Insan Mulia Boarding School (IMBOS) Pringsewu

**Conclusion:** There is no relationship between fat and iron intake with the ability to memorize the Qur'an in female students aged 12-14 years at Insan Mulia Boarding School (IMBOS) Pringsewu.

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## 1. INTRODUCTION

Early adolescence (ages 12-14 years) is a transition period from childhood to adulthood which experiences many changes ranging from physical, thinking, remembering and understanding abilities (Monks, Knoers and Hadinoto, 2019). Teenagers tend to have sharper memories compared to other age groups. Santri are individuals who study at an Islamic boarding school which is generally founded and managed by a kyai as leader, ustadz (male) and ustadzah (female) as educators with the aim of gaining knowledge based on Islamic values (Rasyid 2020; Komariah, 2016). The Qur'an comes from Arabic from the words qara'a-yaqrau-Qur'an which means reading. The Qur'an is a revelation from Allah which was revealed to the Prophet Muhammad gradually in the form of surahs and verses starting with surah Al-Fatihah and ending with An-Nas (Solichah, 2021). The form of practicing the Qur'an is done by reading, memorizing, and understanding it to be applied in daily life as is usually done by students in Islamic boarding schools.

According to etymology, the word memorize comes from the Arabic root word al-hifzh, which means remember, and the word "memorize", which means remember. In terminology, memorizing can also be interpreted as an activity carried out by implanting material into memory with the aim of being able to recall the material in the same way (Febriyana, 2015). Memorizers of the Qur'an are called "Haafidz" (male), and "Haafidzah" (female). These terms come from Arabic, namely "Haffadza" which means to memorize.

In supporting the memorization process, the brain requires nutritional intake, both macronutrients and micronutrients such as fat and iron. Nutritional intake is an external factor other than the environment that supports the memorization process (Putra and Issetyadi, 2010). Consuming foods that are high in antioxidants, long-chain fatty acids or polyunsaturated fatty acids (PUFA) such as omega-3 and omega-6 and minerals plays an important role in improving a person's cognitive function (Jackson and Beaver, 2015; Kim and Kang, 2016). These nutrients are used to increase the size of nerve cells, facilitate nerve transmission (neurotransmitters), and perform various other brain functions (Solichah, 2021). The neurotransmitter acetylcholine interacts with muscarinic and nicotinic receptors to improve memory function, working memory, and thinking speed (Kusuma, Asnawati and Husairi, 2020). Iron intake functions in forming hemoglobin which also helps the growth of oligodendrocyte and myelin cells. Myelin plays a role in accelerating the transmission of impulses or stimuli (Walser *et al.*, 2021; Yunanto *et al.*, 2016). Iron also plays a role in the neurotransmitter system (brain nerve transmitter) which affects concentration, memory and learning ability (Almatsier, 2016). Iron helps the enzyme tyrosine hydroxylase produce norepinephrine and dopamine, while the enzyme tryptophan hydroxylase produces serotonin (Irawan, 2020). Norepinephrine, dopamine, and serotonin play a role in regulating memory ability (Wardhana, 2016). Research conducted shows that iron intake is related to a person's cognitive level (Sari, Sitoayu, Gifari and Nadiyah, 2020).

A person's memory level is also influenced by the hormones produced by the body. The hormones estrogen and estradiol are higher in women than in men. Both of these hormones are very important for maintaining brain health. In addition to playing a role in regulating the menarche cycle, the hormone estrogen also protects the brain's nerves so that they can build various new connections, which are very important for the formation of new memories, such as memorizing. Meanwhile, estradiol contained in estrogen functions to plant and retrieve memories from long-term memory (Paul and Frith, 2018).

Insan Mulia Boarding School (IMBOS) Pringsewu is an Islamic boarding school-based educational institution that prioritizes Islamic character in education. In addition to academics, students are also guided to deepen their religious knowledge by referring to the Qur'an as the holy book of Islam. Halaqah takes place 6 times a week, in which the halaqah is

enforced at least 4 times of memorization of the Qur'an. Students who are used to memorizing the Qur'an, have a target of 1 page of the Qur'an in one deposit, while for students who have just started memorizing the Qur'an, then as practice, the deposit is carried out with a target of ½ page of the Qur'an each time. The halaqah time is carried out from after Maghrib until 21.00 WIB, with a duration for depositing the memorization of the Qur'an for 5-10 minutes per student. In managing food for students, Insan Mulia Boarding School (IMBOS) processes food independently in a private kitchen. The students' meal times are divided into 3, namely morning at 06.00 WIB (before entering school), lunch at 12.00 WIB and afternoon meal at 17.30 WIB.

Based on this background, the author is interested in conducting research on the relationship between fat and iron intake and the ability to memorize the Qur'an in female students aged 12-14 years at Insan Mulia Boarding School (IMBOS) Pingsewu.

## 2. METHODS

This study is an observational study with a cross-sectional design conducted in March-July 2023 at Insan Mulia Boarding School (IMBOS) Pringsewu after obtaining ethical clearance with No.3739/EC/KEP-UNMAL/VII/2023. The population in the study were 113 female students at Insan Mulia Boarding School (IMBOS). The respondents in the study were 60 female students aged 12-14 years who were willing to be respondents by signing an informed consent. The independent variables are fat and iron intake while the dependent variable is the ability to memorize the Qur'an. Intake data were obtained using the food weighing method in the boarding school for 3 days which were then converted using Nutrisurvey software. This study also looked at food consumed outside the boarding school using the Semi Quantitative Food Frequency Questionnaire (SQ-FFQ) as supporting data. Meanwhile, the data on memorizing the Al-Quran was conducted by means of interviews and obtained from the muthaba'ah book notes (a book of notes on memorizing the Al-Quran. Univariate data is presented in the form of median, minimum, and maximum because the data is not normally distributed. The data was then analyzed using the Spearman Rank test.

## 3. RESULTS AND DISCUSSION

The characteristics of the respondents, namely age, are presented in Table 1. The average age of respondents in this study was 13 years.

Table 1. Respondent Characteristics Based on Age

Variable	Mean ± SD	Min	Max
Age (years)	13 ± 0,82	12	14

In general, there is no specific age limit for memorizing, but it cannot be denied that age can affect the ability to memorize. Younger memorizers will easily absorb information that is read, memorized or heard compared to older people (Badwildan, 2012). This is because as age increases, cognitive abilities in the neural system decrease. In addition, cell death in white matter will reduce the blood supply to the brain. Aging will reduce the production of neurotransmitters that carry signals to the brain by about 50%. In addition, aging also reduces neuron cells in the hippocampus by 5% -20% (Mastin, 2010).

Table 2. Frequency Distribution of Fat, Iron Intake and Al-Quran Memorization

Variabel	Median	Min	Max
Fat intake (g)	37,7	32,7	38,6
Iron intake (g)	9,5	5,4	10,6
Memorizing the Qur'an (page)	1	0	2

Table 2 shows that the data measured using the food weighing method for 3 consecutive days at 3 meal times. Respondents' fat and iron intake comes from animal foods including catfish, chicken eggs, and chicken liver. When viewed based on the percentage of Nutritional Adequacy Rate (AKG), respondents' fat intake only meets 55.9% of daily needs.

Based on research conducted at IMBOS Pringsewu, the average student has met the standard for memorizing the Qur'an at IMBOS Pringsewu, namely for each halaqah held 6 times a week, a minimum of ½ page of the Qur'an is required for students who are just learning to memorize the Qur'an, while a minimum of 1 page of the Qur'an is required for students who are used to memorizing the Qur'an. This study is in line with [Ismanto \(2011\)](#) who stated that the arrangement in memorizing the Qur'an affects the memorization ability of students. Students at Islamic boarding schools are targeted to memorize the Qur'an 3 times a day for 3 years.

### 3.1. The Correlation Between Fat Intake and the Ability to Memorize the Qur'an

Statistical analysis showed that there was no relationship between fat intake and the ability to memorize the Qur'an ( $p = 0.642$ ) as measured by the food weighing method. The absence of a relationship between fat intake and the ability to memorize the Qur'an is thought to be due to the limited types and amounts of animal-based foods provided by the Islamic boarding school. Animal foods are the main source of fat. When viewed from the menu served, not every menu has animal side dishes. This is because the Islamic boarding school does not yet have a menu cycle so that the food processed depends on the food ingredients available at that time. The memorization process requires high memory and concentration. Essential fatty acids such as omega-3, especially Docosahexaonic Acid (DHA), are nutritional components that have been proven to increase memory, found in fish and nuts ([Stonehouse et al., 2013](#); [Dighriri et al., 2022](#)). The type of fish consumed by students in Islamic boarding schools is catfish. In 100 g of catfish there are 13.6 g of omega-3 and 22.2 g of omega-6 ([Nurasmı, Sari, Rusmiati, 2018](#)). However, catfish consumed by respondents was 48 g which contained around 6.5 g of omega-3. Nuts such as soybeans are a source of isoflavone antioxidants which can also affect a person's cognitive level if consumed according to needs ([Cui et al., 2020](#)). The sources of nuts provided by the Islamic boarding school include tofu and tempeh which are processed by frying and only with balado chili sauce. Food weighing data shows that there is quite a lot of leftover food for tempeh and tofu side dishes. This is likely due to the less varied processing methods, which causes boredom which has an impact on food acceptance. The fewer or less diverse the menu variations, the greater the level of boredom experienced by a person with a menu ([Umami, 2017](#)). Therefore, a menu cycle is needed to control the menu served in food services including Islamic Boarding Schools. Eggs are also known to be a source of choline (a component of acetylcholine and neurotransmitters) which plays a role in the process of storing memory in the brain if consumed according to needs ([Atomare, 2017](#)). During the research process, eggs were processed by frying and stewing. The results of food weighing showed that eggs were the animal side dish that had the most leftovers compared to catfish, chicken liver and chicken meat. This is likely due to the repeated use of these ingredients in a close time.

In addition to consuming food provided from within the Islamic boarding school, students are also allowed to buy snacks and drinks available in the canteen inside the Islamic boarding school and outside the Islamic boarding school. In addition, students can also get food sent by their parents during the delivery schedule. Based on respondent interviews using SQ-FFQ to see intake from outside the Islamic boarding school for 1 month before the study, data was obtained that the intake of food sources of fat was actually more diverse and the portions were larger when compared to the food provided by the Islamic boarding school. The average

fat intake from outside the Islamic boarding school was 48.20 g. Although this amount is more than the fat intake from within the boarding school, if examined more deeply, it does not meet the daily fat needs according to the respondent's age. Based on the Indonesian Nutritional Adequacy Rate (AKG), the fat requirement for teenage girls aged 12 years is 65 g and for those aged 13-14 years 70 g per day (Kemenkes, 2019).

Fat intake is a variable that indirectly affects the ability to memorize the Qur'an because it must go through memory. Memory is categorized into three, namely sensory memory, short-term memory, and long-term memory, which were not observed in this study.

### 3.2. The Correlation Between Iron Intake and the Ability to Memorize the Qur'an

Statistical analysis shows that there is no relationship between iron intake and the ability to memorize the Qur'an ( $p = 0.835$ ). This study is in line with other studies which state that there is no relationship between iron intake and the ability to memorize the Qur'an in Islamic boarding school students (Rani, 2023). The most easily absorbed source of iron by the body is heme iron with an absorption rate of around 20-30%. The source of heme iron is food that comes from animals. When viewed from the animal foods consumed by respondents in Islamic boarding schools, they include chicken, catfish, chicken eggs, and chicken liver. Based on food weighing for 3 days, the standard portion in Islamic boarding schools for chicken meat is 30 g containing 0.7 mg of iron. Chicken liver 20 g contains 3.16 g of iron. Catfish 48 g contains 0.12 mg of iron. Chicken eggs 55-60 g contain 1.85 mg of iron.

When viewed from food from outside the Islamic boarding school for the past 1 month using the SQ-FFQ method, it was found that the sources of iron consumed by respondents were more diverse. This is also related to the time of the study which was conducted after the school semester break, where data collection on food intake using the SQ-FFQ method was to look back a month or when the students were on holiday from activities at the Islamic boarding school and returned to their respective homes. Based on the SQ-FFQ, respondents consumed fish with an average consumption of 40 g with a frequency of eating only 3-4 times per week. Chicken meat with an average consumption of 40 g with a frequency of eating only 3-4 times per week. Chicken eggs with an average consumption of 55 g with a frequency of eating only 3-4 times per week. During the school semester break which also coincided with the celebration of Eid al-Adha 1444 H, many respondents consumed beef with an average consumption of 35 g with a frequency of eating only 3-4 times per week. Goat meat with an average consumption of 35 g with an average consumption frequency of 1-2 times per week. These results are suspected that the largest contributor of iron as a supporter of brain function in memorizing the Qur'an comes from outside the Islamic boarding school.

Low iron intake is also influenced by foods that work by inhibiting the absorption of iron, such as calcium in milk (Sizet and Whitney, 2020; Waldvogel-Abramoswski *et al.*, 2014). Based on interviews using the SQ-FFQ method, during the last 1 month respondents consumed cow's milk with an average consumption of 250 ml with an average drinking frequency of 3-6 times per week. Calcium is a nutrient that binds iron before it is absorbed by the intestinal mucosa into an insoluble substance. As a result, iron absorption is reduced due to these inhibiting factors and the amount of ferritin is also reduced. This has an impact on reducing the amount of iron needed for hemoglobin synthesis and replacing damaged hemoglobin (Lönnerdal, 2013; Beck, Conlon, and Kruger, 2014). Lack of iron intake will also cause obstacles in the transmission of impulses or stimuli, thus having an impact on decreasing cognitive function, including the ability to memorize and the quality of a person's memorization (Monks, Knoers and Hadinoto, 2019).

In this study, it was not observed how often respondents repeated memorization, so the frequency of repetition of memorization of the Qur'an was not known in detail. In addition,

the level of concentration of respondents in memorizing the Qur'an was not studied. Concentration is needed to foster awareness and attention which has an impact on improving short-term memory performance. This short-term memory will become a good long-term memory if there is a repetition process in memorizing (Julianto and Etsem, 2015).

#### 4. CONCLUSION

There is no corellation between fat and iron intake with the ability to memorize the Qur'an in female students aged 12-14 years at Insan Mulia Boarding School (IMBOS) Pringsewu. Other factors that are suspected of influencing the ability to memorize the Qur'an include the level of concentration and memory that have not been identified so that further research is needed related to these things.

#### 5. REFERENCES

- Almatsier S. (2016). *Prinsip Dasar Ilmu Gizi*. Jakarta: PT Gramedia Pustaka Umum.
- Atomare R et al. (2017). Feeding the brain: The importance of nutrients for brain functions and health. *Progress in Nutrition*. 19(3):243–247.
- Badwildan AS. (2012). *Panduan Cepat Menghafal Al-Qur'an*. Jakarta: DIVA Press.
- Beck KL, Conlon CA, Kruger R, Coad J. (2014). Dietary determinants of and possible solutions to iron deficiency for young women living in industrialized countries: A review. *Nutrients*. 6(9): 3747–76.
- Cui C et al. (2020). Effects of soy isoflavones on cognitive function: a systematic review and meta-analysis of randomized controlled trials. *Nutrition Reviews*. 78(2):134-144.
- Dighriri, et al. (2022). Effect of Omega-3 Polyunsaturated Fatty Acids on Brain Functions: A systematic review. *Cureus*. 14(10):e30091.
- Febriyana L. (2015). Penggunaan Metode menghafal al-Qur'an pada Santri Putri Tahfidz al-Qur'an di Pondok Pesantren Salafiyah Syafi'iyah Sukorejo Situbondo. *Skripsi*, UIN Maulana Malik Ibrahim Malang, Malang.
- Irawan R. (2020). *Nutrisi Molekuler dan Fungsi Kognitif*. Surabaya: Airlangga University Press.
- Jackson D, Beaver K. (2015). The role of adolescent nutrition and physical activity in the prediction of verbal intelligence during early adulthood: a genetically informed analysis of twin pairs. *International Journal of Environmental Research and Public Health*. 12(1): 385-401.
- Julianto V, Etsem MB. (2015). The effect of reciting holy Qur'an toward short- term memory ability analysed trough the changing brain wave. *Jurnal Psikologi*. 38(1): 17-29.
- Kemendes RI. (2019). Angka Kecukupan Gizi yang dianjurkan untuk Masyarakat Indonesia. *Health Report. Kementerian Kesehatan*
- Kim JY, Kang SW. (2016). Relationship between dietary intake and cognitive function in healthy korean children and adolescent. *Journal of Lifestyle Medicine*. 7 (1):10-17.
- Komariah N. (2016). Pondok Pesantren Sebagai Role Model Pendidikan Berbasis Full Day School. *Jurnal Pendidikan Islam*. 5(2):183-198.
- Kusuma H, Asnawati, Husairi A. (2020). Pengaruh sarapan terhadap memori jangka pendek pada Mahasiswa Universitas Lambung Mangkurat. *Homeostatis*. 3(2): 229-234.
- Lönnerdal B. (2013). *Calcium and Iron absorption - Mechanisms and public health relevance*. *International Journal for Vitamin and Nutrition Research*. 80(45):293–299.
- Mastin. (2010). 25th December 2023. *The Human Memory [Internet]*. Web Page. Available from: <http://human.memory.net>.
- Monks FJ, Knoers AMP, Hadinoto SR. (2019). *Psikologi Perkembangan: Pengantar dalam Berbagai Bagiannya*. Yogyakarta: Gadjah Mada University Press.
- Nurasmi, Sari AP, Rusmiati. (2018). Analisis kandungan asam lemak omega 3, omega 6 dan omega 9 dari ikan lele (*Clarias sp*) pada peningkatan nutrisi balita. *Journal of Borneo*

- Holistic*. 1(1): 96-100.
- Paul D, Frith E. (2018). The role of sex in memory function: considerations and recommendations in the context of exercise. *Journal of Clinical Medicine*. 7(6):1-11.
- Putra YP, Issetyadi B. (2010). *Lejitkan Memori 1000%*. Jakarta: Elex Media Komputindo.
- Rani VM. (2023). Hubungan asupan energi dan zat besi terhadap kemampuan menghafal Al-Qur'an di Pondok Pesantren Madrosatul Qur'anil Aziziyah. *Skripsi*, Universitas Islam Negeri Walisongo, Semarang.
- Rasyid H. (2020). Perubahan perilaku santri dari status santri menjadi siswa (studi kasus di SMP Plus Miftahul Ulum pada Lingkungan Pondok Pesantren Al-Usymuni Tarate Pandian Sumenep). *Jurnal Syandhyakala*. 1(2): 93-103.
- Sari M, Sitoayu L, Gifari N, Nadiyah NR. (2020). Analisis asupan energi, zat gizi makro, vitamin c, zat besi, seng dan IMT/U berdasarkan tingkatan kognitif siswa kelas 5 di SD Negeri Duri Kepa 13 Pagi Jakarta Barat. *Media Gizi Mikro Indonesia*. 12(1): 39-52.
- Sholichah F. (2021). Tingkat kecukupan gizi, status gizi, dan status anemia mahasiswa penghafal Al-Qur'an di UIN Walisongo Semarang. *Journal of Nutrition College*. 10(1):62-71.
- Stonehouse W, Conlon CA, Podd J, Hill SR, Minihane AM, Haskell C, Kennedy D. (2013). DHA supplementation improved both memory and reaction time in healthy young adults: a randomized controlled trial. *American Journal Clinical Nutrition*. 97(5):1134-1143.
- Umami R. (2017). Determinan sisa makanan dan estimasi biaya sisa makanan pasien rawat inap di Rumah Sakit Islam Lumajang. *Skripsi*. Universitas Jember, Jember.
- Waldvogel-Abramowski S, Waeber G, Gassner C, Buser A, Frey BM, Favrat B, et al. (2014). Physiology of iron metabolism. *Transfus Med Hemotherapy*. 41(3):213-21.
- Walser M, Svensson J, Karlsson L, Mottaleb R, Aberg M, Kuhn HG, Isgaard J, Aberd ND. (2021). Growth hormone and neuronal hemoglobin in the brain: Roles in neuroprotection and neurodegenerative diseases. *Frontiers in Endocrinology*. 8(11): 1-15.
- Wardhana M. (2016). Role of neurotransmitter in skin immunity. *National Symposium dan Workshop*. Universitas Udayana, Bali.
- Yunanto A, Sanyoto DD, Noor MS, Oktaviyanti IK, Triawati. (2016). *Kapita Selekta Memori dan Nutrisi*. Yogyakarta: Istana Agency.