

Training in Computer-Based Qomariah Month Initial Determination (A Case Study: Determination the Months of Ramadhan, Syawwal, and Dzulhijjah) at Nurul Ikhlas Mosque, Bengkulu City, Bengkulu Province, Indonesia

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Abstract

The determination of the initial of the Qomariah month is still a difference, especially in determining the initial of Ramadhan, Syawwal, and Dzulhijjah. This can happen because there are differences in the method of determination. The method is in the form of Hisab method and Rukyat method. The purpose of community service activities is to determine the initial of the month of Qomariah based on MABIMS criteria (agreement of the Minister of Religion of Brunei Darussalam, Indonesia, Malaysia, and Singapore on 27-29 June 2012 in Bali) and determine the initial of the month using computer software in the form of Accurate Hijri Calculator (AHC) ver. 2.2.1. The method used in this activity is lecture, practice, and discussion. Based on AHC software application ver. 2.2.1 shows that according to calculation 1 Ramadhan falls on Saturday April 2, 2022, but according to MABIMS criteria it falls on Sunday April 3, 2022. This is a possible difference in the start time of fasting in 2022 in Indonesia. However, for 1 Syawwal, both the calculation and the MABIMS criteria fall on the same day, Monday May 2, 2022, both in Indonesia and in other countries.

Keywords: Qomariah, Ramadhan, Syawwal, MABIMS, and AHC.

INTRODUCTION

The determination of the initial of the Qomariah month is still a difference, especially in the case of determining the initial of Ramadhan, Syawwal, and Dzulhijjah. This can happen because there are differences in the method of determination. The determination method is generally carried out using the Rukyat method and the Hisab method (Iman, 2016). The Rukyat method is an activity to determine the initial of the Qomariah month by observing the moon (hilal) on the ijtimak day or the 29th day of the current month. If the new moon is seen in the evening, then the next day is the new moon on the Hijri calendar. This method is usually used to determine the start of the month of Ramadhan, Syawwal, and Dzulhijjah (Dzulfaroh, 2020). While the Hisab method is an initial determination activity on the Hijri calendar without seeing the appearance of the new moon at the end of the month, but using mathematical calculations according to geometric criteria (Anwar, 2012).

According to Iman (2016), the Rukyat concept has received a calculation system, but not as a determinant in determining but as a tool. The Rukyat concept of the results of this calculation provides a requirement that the new moon will be visible if the height is at least 2 degrees after the conjunction before sunset at the end of the current month. These two methods complement each other. This Hisab method will make it easier to carry out the correct Rukyat activities (Dzulfarah, 2020). In determining the initial of the month of Ramadhan, Syawwal, and Dzulhijjah, they are still required to observe the new moon (Rukyat) (Pramesti, 2007). In accordance with the provisions of allied countries (Ministers of Religion of Brunei Darussalam, Indonesia, Malaysia, and Singapore or MABIMS), the new moon can be Rukyat if the height of the new moon is at least 2 degrees, the angle of elongation is at least 3 degrees, and the age of the new moon is at least 8 hours after ijtimak/conjunction occurs (Amir, 2017).

The general public is still unfamiliar with determining the initial of the month in the Hijri calendar, especially regarding the MABIMS criteria. For this reason, it is necessary to carry out "Training of Computer-Based Qomariah Month Initial Determination (a Case Study of Determining the Months of Ramadhan, Syawwal, and Dzulhijjah) in Nurul Ikhlas Mosque, Bengkulu city, Bengkulu Province, Indonesia." This activity is expected to increase public knowledge about determining the initial of the month on the Hijri calendar using a computer independently according to MABIMS criteria (agreement of the Minister of Religion of Brunei Darussalam, Indonesia, Malaysia, and Singapore on 27-29 June 2012 in Bali). The aims of this community service activity are to determine the beginning of the month on the Hijri calendar based on MABIMS criteria and determine the initial of the month on the Hijri calendar using a computer and software application.

Hijri Calendar History

The Hijri calendar began with the caliphate of Umar ibn Khattab. This was realized when a friend corresponded without including the date and day the letter was sent, making it difficult to archive it, especially in selecting the order of letters (Hadi, 2020 and Ismail and Rasyidin, 2019). Based on this case, the sahabats deliberated to determine when to start the calendar. The results of the deliberation decided that the calendar began with the migration (hijrah) of the Prophet Muhammad and his sahabats from Mecca to Medina, namely on 2 Rabi'ul Awal or 20 September 622 AD. The time when this event occurred is designated as the year 1 Hijri. Therefore, the calendar is called the Hijri calendar. However, the official use of the Hijri calendar begins on the 8th of Rabi'ul Awal in 17 H (Hadi, 2020). In general, the Hijri calendar is about 11 days faster each year than the Gregorian calendar system (Pramesti 2007).

Hijri/Qomariah Month Determination Method

Determination of the Qomariah month on the Hijri calendar is generally divided into two methods. The first method is the Hisab method and the second method is the Rukyat method (Iman, 2016). However, specifically in determining the month of Ramadhan, Syawwal, and Dzulhijjah, apart from the two methods, there are also several other methods, including observing the tides and Javanese calculations (Herlambang, 2020), Hisab 'urfi khumasi' which has been modified with customary taboos of followers of Habib Seunagan Nagan Raya-Aceh (Ismail and Rasyidin, 2019).

Hisab Method

The Hisab method is a method of determining the initial of the Qomariah month based on calculations of the circulation of celestial bodies, especially the earth, sun, and moon, without the need to wait for the results of the sighting of the new moon (Basori, 2015 and Ismail, 2016). This method is very suitable for countries that are on the equator like Indonesia. Because in the equator it is relatively difficult to do hilal sightings. This equator also affects the duration of fasting time. The farther from the equator, the longer the duration of fasting (especially during the summer). If a country's position is at the equator, it has a fasting duration of around 12-13 hours, then in areas far from the equator, it can reach a fasting duration of around 18 hours, and some countries even have more than 18 hours (Mubyarsah, 2021). Currently, many Hisab methods have utilized mathematical calculations using computers and software applications. Hisab calculations using this computer have a high level of precision and accuracy. Hisab calculations is usually done before the Rukyat is performed. One of the results of Hisab is based on the time of conjunction or ijtimak, which is a process where the sun, moon, and earth are at that time in a plane position (Amir, 2017). The positions of the sun, moon and earth during conjunction can be seen in Figure 1.

The Hisab method is also divided into two, namely the Hisab "haqiqi taqribi" method and the Hisab "haqiqi tahqiqi" method. The Hisab "haqiqi taqribi" method is a calculation method using the measurement of the height of the moon based on the age of the moon, while the Hisab "haqiqi tahqiqi" method is a calculation method by measuring the actual position of the moon (Ismail, 2020). According to astronomical terminology, the moon moves east on average 12° per day, so

it can be estimated that the moon's height is half its age. The calculation can be estimated from $(12^\circ/24) \times \text{moon age}$. If *ijtimak* occurs at 13:30 WIB, while maghrib time is at 18:30 WIB, then the age of the month is 5 hours and the height of the moon can be estimated from $5/2 = 2^\circ$. Calculations using the *Hisab "taqribi"* method will generally produce a higher value than the *Hisab "haqiqi"* method (Ismail, 2020).

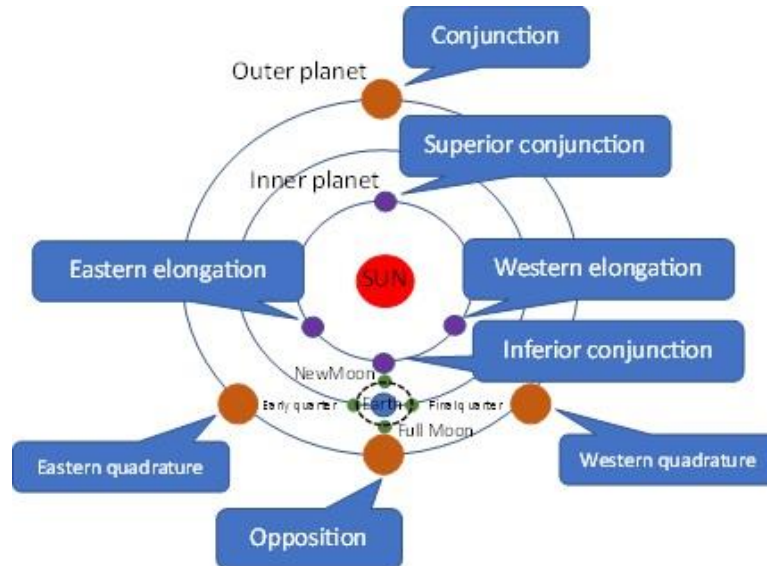


Figure 1. The position of the sun, moon, and earth during conjunction (Ismail, 2020).

Rukyat method

The Rukyat method is an activity of observing the appearance of the new moon which first appears on the horizon at sunset on the western horizon before the turn of the moon using both optical aids and with the naked eye (Herlambang, 2020 and Iman, 2016). For the case of the month of Ramadhan, Rukyat is an activity of observing or seeing the moon at the end of the month of Syakban (Amir, 2017). If the new moon has not been seen at the time of the observation, it is obligatory to complete it to 30 days and fasting will be carried out the following day. For this method it will be very difficult to do if the weather is covered by clouds, because the moon can only be seen 1.25% of the sun's exposure emitted to the moon when the sun is about to set on the western horizon (Ismail, 2020).

Imkan Rukyat Method

Based on the two methods above, Rukyat method and *Hisab* method there is *Imkan Rukyat* method which is an intermediate method. The *Imkan Rukyat* method requires that the moon will be visible using certain criteria, namely the height of the new moon is at least 2 degrees, the angle of elongation between the moon and the sun is at least 3 degrees, and the occurrence of conjunction or new moon is at least 8 hours old when the moon sets at the end of the current month (Herlambang, 2020 and Amir, 2017). This method can be used as a meeting point solution for determining the beginning of the Qamariyah month (Marpaung, 2015).

The criteria for determining the beginning of the month of Qomariah based on the agreement of the hilal trial of the Islamic countries of the world in Istanbul, Turkey in 1978 are the minimum height of the new moon of 5° when it sets, the distance of the new moon from the sun is at least 8 degrees, and the age of the new moon is at least 8 hours after the *ijtimak* occurs. However, these provisions often adjust to geographical conditions and other technical difficulties, so that the Ministers of Religion of allied countries, namely Brunei Darussalam, Indonesia, Malaysia, and Singapore (MABIMS) agreed to combine the rukyatul hilal criteria based on Turkish criteria and the combination of Rukyat-*Hisab* as stated on the requirements of the *Imkan Rukyat* method described in the previous paragraph (Amir, 2017).

Software Application Accurate Hijri Calculator ver. 2.2.1

Accurate Hijri Calculator (AHC) ver. 2.2.1 is a development of the previous software, namely Accurate Hijri Calculator ver. 2.2. This software was developed by Abdurro'uf (2013). The AHC software was developed as a tool for calculating the initial determination of the month of Qomariah which is quite accurate. Some of these developments include the use of the VSOP87 algorithm to calculate sun coordinates in calculating prayer times, upgrading the city database, and upgrading the Crescent menu, and others. Utilization of AHC software includes calculating lunar and solar coordinates, converting the Gregorian calendar into the Hijri calendar, visually predicting the appearance of the moon at locations around the world, calculating all parameters for determining the start of the months of Muharram, Ramadhan, Syawal, and Dzulhijjah (Abdurro'uf, 2013).

METHODS

The method used in community service activities is carried out through three approaches, namely: lectures, practice, and discussion. In this lectures approach, knowledge lectures are conducted regarding the method of determining the initial of the Qomariah month on the Hijri calendar based on MABIMS criteria and determining the beginning of the month using the Accurate Hijri Calculator (AHC) ver. 2.2.1. For this practice approach is carried out through direct practice of determining the initial of the Qomariah month on the Hijri calendar using the Accurate Hijri Calculator (AHC) ver. 2.2.1. Then the discussion was carried out to deepen the material provided and other matters related to the method of determining the Qomariah month and the application of AHC ver. 2.2.1. If the audience still does not understand the material, an explanation will be made again about the material provided. After all the stages have been carried out the final step is activity analysis. Activity analysis aims to monitor the effectiveness of activities that have been implemented. The steps of this method are shown in a flowchart as shown in Figure 2.

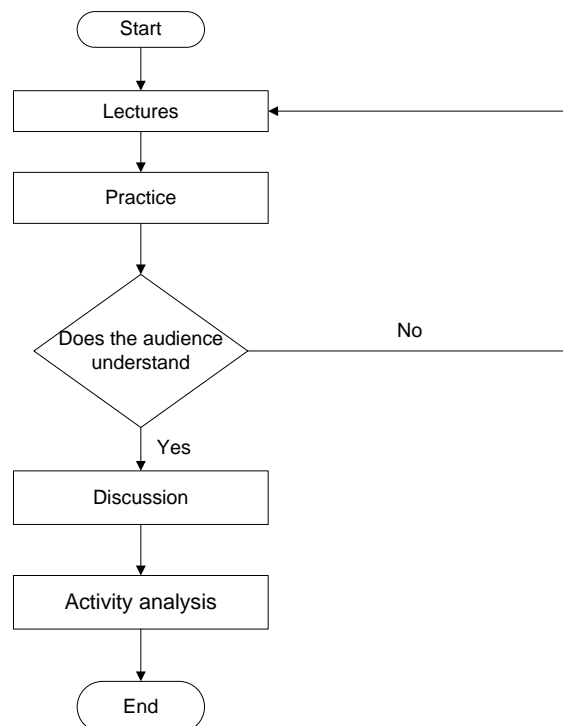


Figure 2. The steps of the community service method.

RESULTS AND DISCUSSION

Community Service Activities have been carried out at the Nurul Ikhlas Mosque, Bengkulu city, Bengkulu Province, Indonesia. This activity was attended by the Jama'ah of the mosque as many as 23 people. In this activity, a presentation was made on the history of the Hijri calendar, the method of determining the Qomariah month, its criteria, and an introduction to software applications to the Jama'ah. Then proceed with the practice of using the application directly. After that, a discussion was held about the use of software and case studies on determining the month of Qomariah, especially for determining the beginning of the month of Ramadhan, Syawal, and Dzulhijjah. The series of community service activities is shown in Figure 3, Figure 4, Figure and 5.



Figure 3. Explanation of the history of the Hijri calendar, the method of determining the Qomariah month, and its criteria to the Jama'ah by the Community Service Team.



Figure 4. Introduction and practice of the Accurate Hijri Calculator (AHC) ver. 2.2.1.



Figure 5. Discussions to deepen the material provided and other matters related to determining the Hijri calendar.

In this activity, examples of case studies were also carried out to determine the beginning of the months of Ramadhan, Syawwal, and Dzulhijjah in 1443 H or 2022 M based on the Hisab method using the Accurate Hijri Calculator ver. 2.2.1 in several cities in Indonesia and other countries. For the case of the beginning of the month of Ramadhan in 2022 AD in the Bengkulu city and the Mecca city, Saudi Arabia, it is shown in Figure 6 and Figure 7.

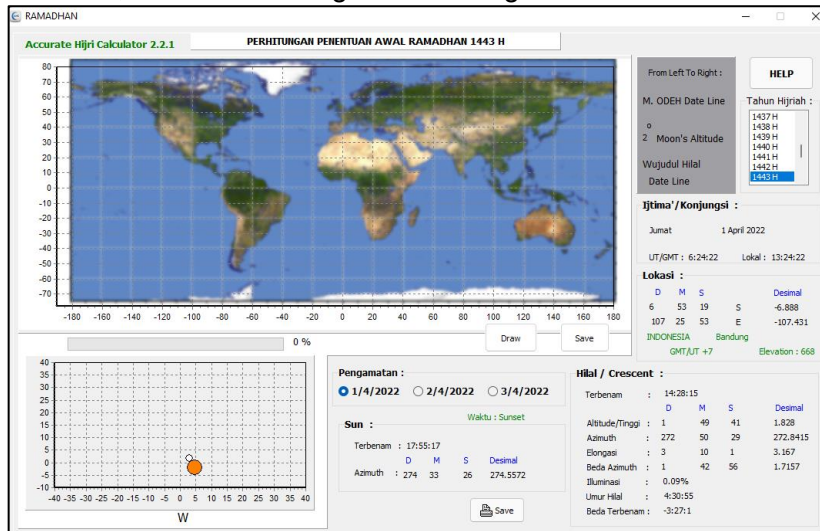


Figure 6. An example of the initial display of the month of Ramadhan 1443 H or April 1 2022 AD in Bengkulu city with the height of the new moon is 1.83° (Abdurro'uf, 2013).

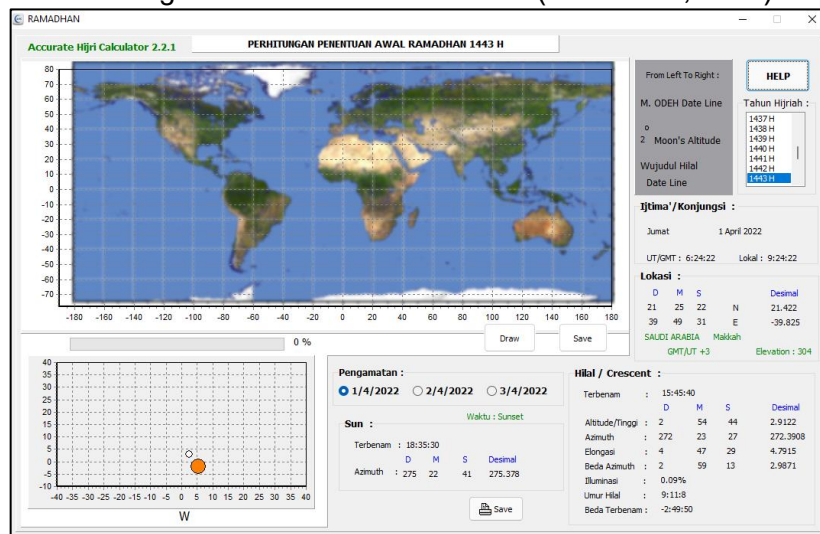


Figure 7. An example of the initial display of the month of Ramadhan 1443 H or April 1 2022 AD in Mecca city, Saudi Arabia with the height of the new moon is 2.91° (Abdurro'uf, 2013).

Figure 6 shows that on Friday 1 April 2022 in the Bengkulu city, a new crescent was visible according to reckoning. The height of the new moon at that time was 1.83° , the angle of elongation was 3.17° , and the age of the new moon was 4 hours 30'55", while Figure 7 shows that on the same day in Mecca city, Saudi Arabia, the new moon was also visible new moon with a height of 2.91° , an elongation angle of 4.79° , and an age of 9 hours 11'8".

According to Hisab calculation, on Friday 1 April 2022 a new moon has been seen, which means that the next day, April 2, the fasting month of Ramadhan begins both in Bengkulu city and in Mecca city, Saudi Arabia. However, based on the MABIMS criteria for the Bengkulu city it has not been fulfilled because the height of the new moon is $< 2^\circ$ and the age of the moon is < 5 hours even though the elongation angle has been fulfilled, namely $> 3^\circ$, while for the Mecca city, Saudi Arabia it has met the MABIMS criteria.

In Bengkulu city, the MABIMS criteria will be met if it occurs on Saturday 2 April 2022, which means that the fasting month of Ramadhan will begin on Sunday 3 April 2022 as shown in Figure 8. Based on this analysis, it can be estimated that there is a possibility that in 2022 there will be a difference in when the Ramadhan fast begins in Indonesia.

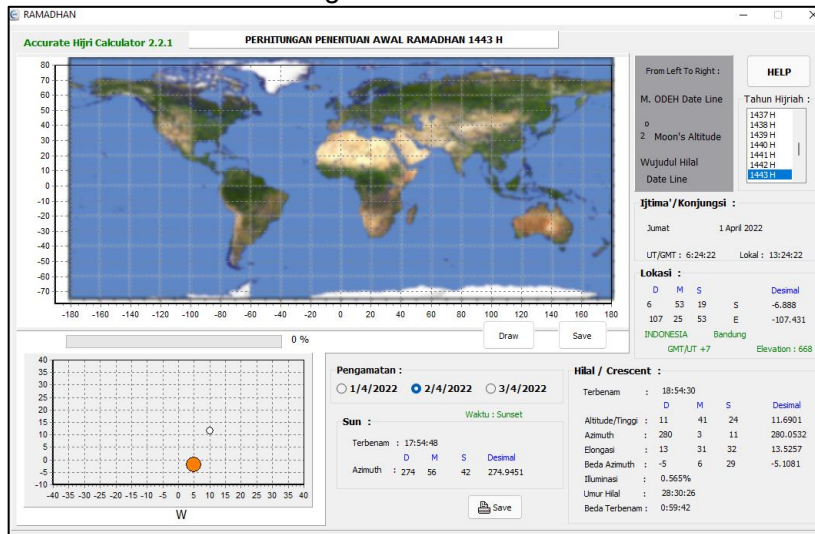


Figure 8. A display example of the month initial of Ramadhan 1443 H or April 2, 2022 in Bengkulu city with the height of the new moon is 11.69° (Abdurro'uf, 2013).

For the case of determination, the initial of the month of Syawwal 1443 H, especially in Bengkulu city, it is shown in Figure 9. In Figure 9, the new moon can be seen on Sunday, May 1, 2022 with a height of 4.84° , its elongation angle is 6.09° , and the age of the moon is 14 hours 39'10". In this case all MABIMS criteria have been met, so it is estimated that there is no difference in the time of 1 Syawwal 1443 H in Indonesia, which means that 1 Syawwal falls on Monday, May 2 2022.

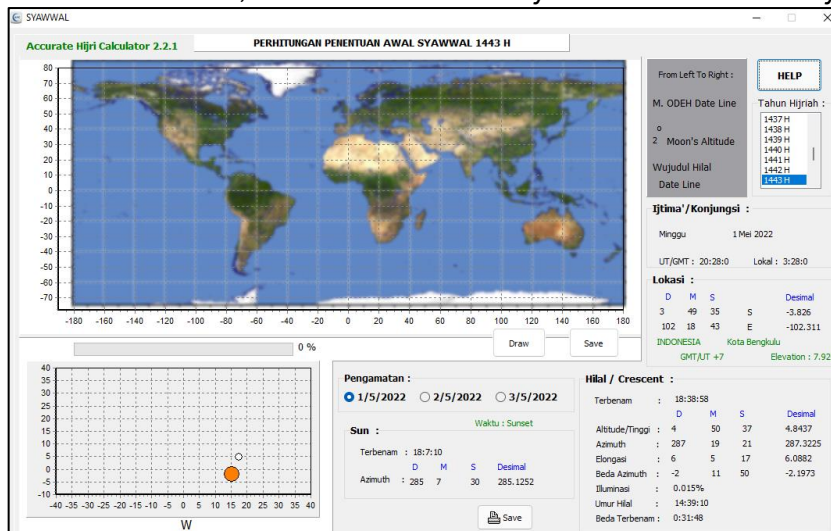


Figure 9. A display example of the month initial of Syawwal 1443 H or May 1 2022 in Bengkulu city with the height of the new moon is 4.84° (Abdurro'uf, 2013).

In the case of 10 Dzulhijjah, there is basically no difference and it falls on July 9, 2022. For this reason, community service activities are more focused on determination the start of the month of Ramadhan and Syawwal. The determination of the beginning of Ramadhan and the beginning of Syawwal in several cities in Indonesia and the world along with the height of each new moon is shown in Figure 10.

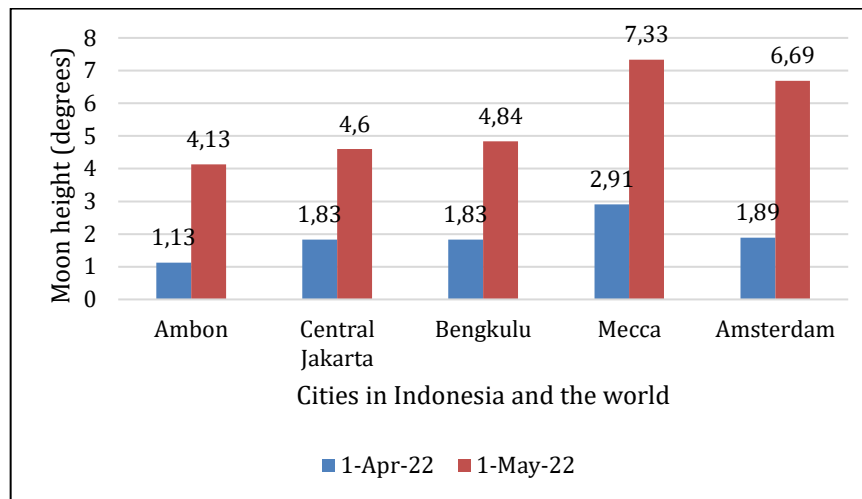


Figure 10. The height of the new moon in several cities in Indonesia and the world for the case of Ramadhan and Syawwal 1443 H or 2022.

Figure 10 shows that the height of the new moon on April 1 2022 in Indonesian cities (Ambon, Central Jakarta, Bengkulu) and Amsterdam, the Netherlands is less than 2° , while in Mecca city, Saudi Arabia the new moon is above 2° . Based on the criteria from MABIMS, in general, in Indonesia and in Amsterdam, the Netherlands, if the moon sightings cannot be seen. However, in the city of Mecca, Saudi Arabia, if the moon is Rukyat, it is possible to see it because the altitude is above 2° . If based on the MABIMS criteria, then fasting starts on April 3, 2022 for Ambon city, Central Jakarta, Bengkulu, and Amsterdam, while in Mecca, fasting starts on April 2 2022. For the height of the new moon on May 1, 2022, if it is seen in the Rukyat it is most likely the month of can be seen in Indonesian cities, especially Ambon city, Central Jakarta, and Bengkulu as well as in other parts of the world, namely Mecca and Amsterdam, so that for the Syawwal 1, 1443 H case it is unlikely that there will be any differences between one region and another, which falls on the May 2, 2022.

CONCLUSION AND RECOMMENDATION

Based on the MABIMS criteria, determination the month initial in the Hijri calendar can be determined using the Accurate Hijri Calculator ver. 2.2.1. In the case of determination, the month initial of Ramadhan 1443 H or 2022 AD there may be differences between the Hisab method and the Imkan Rukyat method. According to the Hisab method, Ramadhan falls on April 2, 2022, while according to the Imkan Rukyat method it falls on April 3, 2022. For the month of Syawwal 1443 or 2022 AD there may be no difference, namely May 2, 2022. In the example of the 10 Dzulhijjah case, basically there is no difference which falls on July 9, 2022. Training using the software application Accurate Hijri Calculator ver. 2.2.1 in this community service activity should also be given to other target audiences, for example to mothers or food entrepreneurs related to breaking the fast or Eid food to prepare for welcoming the month of Ramadhan and Syawwal.

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