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An Analysis of the Ancient Babylonian Calendar System and Its Similarities with the Hijri Calendar

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Abstract: *The Babylonian calendar became one of the most widely followed calendar systems in the history of world civilisation because the Babylonian science was more developed than other nations of its time. One of the calendar systems that adopted the Babylonian calendar system was the Sippar and Elephantine calendars, all of which were in the Middle East, because of these developments it is possible that some lunar-based calendars in the Middle East have similarities with the Babylonian calendar including the Hijri calendar because Muslims were originally a nation living in Arabia (Middle East), So in this research will be examine the similarities between the Babylonian calendar and the Hijri calendar in aspects of their calendar systems, such as the beginning of the day, the number of days and the beginning of the month. To find out this, the author uses a descriptive analytical literature research method. This research found five similarities between the two calendar systems, namely in terms of the object observed in the determination, the rule of the number of days, the method of determination, the determination of the government authority, and the same day cycle.*
Keywords: *Babylonian Calendar, Calendar, Hijri Calendar.*

Abstrak: *Kalender Babilonia adalah salah satu sistem kalender yang paling banyak diikuti dalam sejarah peradaban dunia karena ilmu pengetahuan orang Babilonia memang lebih maju daripada bangsa-bangsa lain pada masanya. Salah satu sistem kalender yang mengadopsi sistem kalender Babilonia adalah kalender Siprus dan Elephantine, yang semuanya terletak di Timur Tengah, karena perkembangan ini, sangat mungkin beberapa kalender lunar di Timur Tengah memiliki kemiripan dengan kalender Babilonia, termasuk kalender Hijriah karena umat Islam pada awalnya adalah bangsa yang tinggal di Arab (Timur Tengah), sehingga dalam kajian ini akan dikaji kesamaan kalender Babilonia dan kalender Hijriah dalam aspek bagaimana sistem penanggalan mereka, seperti permulaan hari, jumlah hari dan permulaan awal bulannya. Untuk mengetahui hal tersebut, penulis menggunakan metode penelitian literatur dengan analisis deskriptif. Penelitian ini menemukan bahwa ada 5 kesamaan umum dari kedua sistem kalender ini, yaitu dari segi objek yang diamati dalam penentuannya, aturan jumlah hari, metode penentuan, penentuan dari otoritas pemerintah dan siklus hari yang sama.*
Kata Kunci: *Kalender, Kalender Babilonia, Kalender Hijriah.*

A. Introduction

The Babylonians were an ancient people that became the center of an extraordinary civilization in their time founded in 2300 BC, located about 50 miles south of Baghdad along the Euphrates River (present-day Iraq).[1] The development of knowledge in the Babylonians was so rapid that its knowledge and civilization became a reference for the nations born after it, such as its legal knowledge that had developed such as the law of Hamurrabi, good mathematics, astrology and

[1]Historis.com Editors, "Babylon," History Channel, February 2, 2018, https://www.history.com/topics/ancient-middle-east/babylon, (accessed December 05, 2023).

astronomy were also very extraordinary.[2] One of the proofs of the development of astronomy is the creation of the Babylonian calendar system whose dates are based on the phases of the moon.[3]

The calendar was designed by the Babylonians as one of the instruments of time marking, such as agricultural time, paying taxes, worship and certain other times. This is because the calendar is held with the function and purpose of organizing time units, as a marker and calculation of time in the long term. The calendar is closely related to the timing of hunting, farming, migration, worship, and the celebrations as the Babylonians formed their calendar system. This important role was more felt by previous nations, even though the function of today's calendar is still very vital.[4]

The use of the circulation of the phases of the moon as one of the references in the calendar system is also used in the Hijri calendar implemented by the Islamic community. The Hijri calendar is a calendar that was historically formed during the time of the caliph Umar bin Khattab, the idea began when the governor of Kuffah, Musa al-Ash'ari, conveyed to Umar bin Khattab that "indeed several letters from the caliph have reached me but the letters have no date" because of this problem Umar bin Khattab held a meeting and discussed the creation of a calendar system for Muslims, which was then called the Hijri calendar.[5]

Based on this explanation, it is known that the Ancient Babylonian calendar and also the Islamic Hijri follow the lunar cycle, so it is implicitly known that the two calendars are basically the same method of the calendar system namely the lunar based calendar system, so that it can be studied about the implementation of the two calendars in running the lunar calendar system, especially until now there is no concrete genealogy about where the Hijri calendar came from whether it is purely from the Prophet or refers to the knowledge of the previous nation.

Writings that discuss the Babylonian Dating and Knowledge System have actually been done several times by other researchers. Such as writings about the civilization and science of the Babylonians, including writings (Bella Safitri and Debi Setiawati)[6] that focus on the scientific heritage owned by the Babylonians, but in this article it is not explained about how the Babylonian calendar system is, only explained that the Babylonians have their calendar system. Also writings (Dede Nurjanah, Enur Nurjanah)[7] that explain the knowledge of the Babylonians who have contributed to Arab knowledge, namely from the aspect of mathematics (al-Jabar). Also the article

[2]Paul Kriwaczek, *BABYLON Mesopotamia and the Birth of Civilization*, Terj. Debby Lukito and Isma B. Koesalamwardi, (London: Atlantic Books, 2012), h. 317.

[3]D. D. Luckenbill, "The Babylonian Calendar," *The American Journal of Theology*, 1918, h. 140.

[4]Susiknan Azhari, *Ensiklopedia Hisab Rukyat*, Cet II (Yogyakarta: Pustaka Siswa, 2008), h. 115.

[5]Nurul Wasilah Wahidin, "Masalah Penyatuan Kalender Hijriah," *AL – AFAQ: Jurnal Astronomi dan Astronomi, Fakultas Syariah, Universitas Islam Negeri (UIN) Mataram* 4, no. 2 (2022), h. 277.

[6]Bella Safitri dan Debi Setiawati, "Kontribusi Peradaban Babilonia terhadap Perkembangan Budaya di Abad ke-21," *Dewaruci: Jurnal Sejarah dan Pengajarannya* 1, no. 1 (2022).

[7]Dede Nurjanah dkk., "Kontribusi Sejarah Al-jabar Babilonia dan Aljabar Arab terhadap Pemikiran Aljabar," *Jurnal Analisis* 7, no. 2 (2021).

(Douglas MacDougal)[8] focuses on studying the astronomical knowledge of the Babylonians, namely the study of the accuracy of the period of the synodic cycle of Mars that has been compiled by the Babylonians.

Several writings also mention the adoption of the Babylonian calendar, one of which is the writing (Samuel Greengus)[9] the writing discusses that the ancient Babylonian calendar is a calendar that was widely adopted by the calendar system of other nations in the past, one of which is the Cyprus region which is the focus of this article. Also the writing (Sacha Stern)[10] discusses that the Elephantine calendar system in certain parts has similarities with the Babylonian calendar such as the naming of the names of the months as described in the writing. From some of these writings about the Babylonian calendar, it has been referred to by several calendar systems in various regions, but from some of these writings, no one has studied the similarity between the Babylonian calendar and the Hijri calendar system.

In addition, several writings about the calendar in general and also the Hijri calendar have also been carried out several times, including writings (Muhammad Sholehuddin and Siti Tatmainul Qulub)[11] which discuss the similarities between the Javanese Islamic calendar and the Hijri Calendar, as well as writings (Nihayatur Rohmah)[12] that focus on the major aspects that are possessed by the calendar system in the world, namely explaining the *Solar system*, *Lunar* and *Luni-Solar*, as well as writings (A. Jusran Kasim, et al)[13] and (Abdul Mufid, et al)[14] that focus on the history of the hijri calendar and the criteria for the beginning of the month in its determination globally.

Based on these previous writings, the author in this study tries to focus on a different point of view, namely on the aspect of studying the Babylonian calendar system as one of the parent sciences of astronomy which is then linked to the Hijri calendar as a calendar that emerged long after the Babylonian calendar was formed, considering that based on the literature review above, no writings have been found that examine the theme that the author will raise. The author thinks that the two are related because in determining the beginning of the month they use the same

[8]Douglas MacDougal, "Exploring the Mysteries of Babylonian Astronomy with Maple," *Maple Transaction* 2, no. 1 (2022).

[9]Samuel Greengus, "New Evidence on the Old Babylonian Calendar and Real Estate Documents from Sippar," *Journal of the American Oriental Society* 121, no. 2 (2001).

[10]Sacha Stern, "The Babylonian Calendar at Elephantine," *Journal of Papyrology and Epigraphy*, 2000.

[11]Muhammad Sholehuddin dan Siti Tatmainul Qulub, "Analisis Kesesuaian Kalender Islam Jawa dengan Kalender Hijriah," AL *–AFAQ: Jurnal Astronomi dan Astronomi* 4, no. 1 (2022).

[12]Nihayatur Rohmah, "Dinamika Almanak pada Periode Pra-Islam hingga Era Islam; Studi tentang Penanggalan Tata Surya, Bulan dan Luni-Surya," *QALAMUNA: Jurnal Pendidikan, Sosial, dan Agama* 11, no. 2 (2019).

[13]A. Jusran Kasim dkk., "Penetapan Kalender Hijriah dalam Sejarah Islam dan Kriterianya di Asia Tenggara," *Jurnal Al-Tamaddun* 19, no. 1 (2024).

[14]Abdul Mufid dkk., "Penyatuan Kalender Hijriah Sedunia Di Indonesia: Upaya Melestarikan Sunnah Maqasid Nabi (SAW)," Jurnal *Pemikiran dan Peradaban Islam (JITC)* 10, no. 2 (2020).

method considering that the Ancient Babylonians were a nation that liked to observe and the Muslims at the time of the Prophet also liked to observe in determining the beginning of the month. To what extent did the Ancient Babylonian calendar have in common with the Hijri calendar system? This is one of the things that will be examined in this article.

This paper aims to examine the discussion of how the relationship between the Babylonian calendar as the parent of the lunar system calendar and the Hijri calendar as a *lunar* calendar is also a lunar system. Apart from the Hijri calendar which is mentioned several times directly in the Qur'an, but from a broader perspective, the author seeks to find the sciences of the Babylonian calendar system that have similarities with the Hijri calendar, because as it is known that there is nothing completely new in this life, most things, especially knowledge, develop because of the initial knowledge of the previous nation which was later developed by the nation who were born afterwards.

B. Methods

The research method used in this study is qualitative research with the type of library research. To support this, the author in the data collection method will use documentation studies which are then analyzed using descriptive analysis techniques, namely after the data related to the research is collected, then arranged and classified, then analyzed and interpreted using words in such a way and validated the accuracy of the data results so that comprehensive results are obtained from the research object.

C. Result and Discussion

1. Calendar

The calendar is an invention of the human mind designed for human convenience. This is based on the observation of natural phenomena that humans use to calculate the progress of time in order to regulate their own activities. The more complex a society grows and the wider the area of its activities, the greater the need to coordinate its activities, and the greater the need for more accurate methods of calculating time, the increase in accuracy depends on the activities of astronomical and mathematical knowledge of a nation's society.[15]

The calendar is designed to coordinate periodic astronomical events (years, solstices, phases of the moon, days, etc.) with periodic human events (anniversaries, religious, anniversaries, holidays, Sabbaths, etc.), simply put, the function of the calendar is to tie the history of the earth to the celestial cycle. The basic unit of the calendar is the year, and the base unit of the hour is the day.[16] In the history of the development of the calendar that has been passed by many civilizations,

[15]Agnes Kirsopp Michels, *The Calendar of The Roman Republic* (Unites States of America: Princeton University Press, 1967), h. 3.

[16]John Durham Peters, "Calendar, Clock, Tower," *Massachusetts Institute of Technology*, 2013, https://web.mit.edu/comm-forum/legacy/mit6/papers/peters.pdf, h. 1.

it turns out that each civilization has its own system of management with different characteristics. The civilization built by humans in its development cannot be separated from the calendar, because all human activities require regulations, scheduling, and arrangements that are regular and definitive.[17] In general, in determining the calendar time of the Ancient or Modern nations use the circulation of the sun or the moon, or also use both. This resulted in the term solar calendar (which uses the solar cycle), the *lunar* calendar (which uses the lunar cycle), and the *luni-solar calendar* (which uses the circulation of both).[18]

Based on this explanation, the calendar was in fact born to meet human needs in the practice of daily life that is inseparable from time. Humans who need to schedule time for hunting, working, farming, resting and other activities make in the end humans create an orderly scheduling system using the basis of the circulation of celestial bodies such as the circulation of the sun or the circulation of the moon which is determined by making observations or observations.

2. Ancient Babylonian Calendar System

The Babylonian Calendar is a Lunar based Calendar system [19] where a month stretches from the first visibility of the crescent moon after the conjunction of the sun to the first visibility of the next one.[20] But a few hundred years later they realized that the lunar circulation did not correspond to seasonal times such as farming time, so they adapted their calendar system into a Lunisolar system. The Babylonians limited the number of days in a *lunar* month to a maximum of 30 days, the beginning of the new crescent moon on the night of the thirtieth day marks the beginning of the new moon, but if the new crescent moon is not visible for any reason then the next month begins on the night of the 30th of the first month of the current month. Therefore, the months consisting of 29 and 30 days alternate in an irregular order, so this calendar does not have a specific number of days in each month.[21]

Observing the crescent moon (hilal) when the sun has set with the aim of determining the beginning of the new moon shows that the beginning of the day in the Babylonian calendar is when the sun has set, of course it is different from the beginning of the day in the solar calendar. The Babylonian calendar is entirely an observational calendar.

[17]Arwin Juli Rakhmadi Butar Butar, *Kalender & Sistem Waktu dalam Islam* (Medan: Umsu Press, 2021), h. 1.

[18]Yumna Nur Mahmudah, "Sejarah Penggunaan Kalender Aji Saka di Jawa," *AL –AFAQ: Jurnal Astronomi dan Astronomi* 5, no. 2 (2023), h. 183; Moelki Fahmi Ardliansyah dan Triska Katrin Ningtias, "Bilah Kalender dalam Pengembangan Harta Karun Instrumen Falak," *AL –AFAQ: Jurnal Astronomi dan Astronomi* 4, no. 1 (2022), h. 97.

[19]Michael Falk, "Astronomical Names for the Days of the Week," *Journal of the Royal Astronomical Society of Canada* 93 (1999), h. 122.

[20]Herman Hunger, Wien, and Erica Reiner, "A Scheme For Intercalary Months From Babilonia," *Departement Of Oriental Studies University Of Viennaa* 65 (1975), h. 21.

[21]Bickerman and Elias Joseph, *Chronology of the Ancient World* (New York: Cornell University Press, 1980), h. 22.

The Babylonians used a leap system in compromising the difference between the lunar year and the solar year, although some literature mentions that there was no specific pattern throughout Babylonian history related to the distribution of leap moons, so it can be understood that in determining the leap system the Babylonians are not expected to use a calculation formula. The estimate of the Babylonian leap method was only predicted in a rule that developed when astronomy was far advanced, and the most famous is the *Pleiaden-Schaltregel* rule, which states that "If the Moon and the Pleiades coincide on the first day of Nisan, then this is a normal year, but if the Moon and Pleiades coincide on the third day of Nisan, then this is a leap year."[22]

In general, the Babylonians added 3 months in a time bracket of 8 years, this is because every 8 years will be collected approximately 90 days of the difference between the lunar and solar calendars. This 3-month addition is placed sometimes after the 6th month or sometimes after the 12th month. With this restoration, the date used is in accordance with the appearance of the moon and the period of river flooding or the harvest season.[23]

More importantly, according to Stevel Jaedal the rule of lunar intercalation (recalnation) seems to be very simple according to Ancient Babylonian tradition:[24]

a. If the summer solstice occurs after the new moon immediately after the end of Month III (i.e. after 6 days or more), enter the leap month VI (add 1 month after the sixth month).
b. If the winter solstice is certain to occur after the new moon immediately after the end of Month IX (i.e. after 6 days or more), insert leap month XII (add 1 month after the twelfth month).

As with leap months, the insertion of additional days is not fixed in a specific year in each cycle, but it can fluctuate depending on the appearance of the new moon. The proposed structure of the calendar scheme causes the date of the new moon to shift towards the 7th day towards the end of the odd cycle year when all months are allocated 29 days. Therefore, adding an extra day to a 29-day month could be a method that astrologers in the Ancient Babylonian period might have used to reduce calendar deviations. More importantly, the provision of the number of days to 30 that does not have this rule potentially explains why previous studies have failed to detect the existence of "leap" days in the Babylonian calendar scheme, especially since it is assumed that the length of the month is determined only by visual confirmation (observation).[25]

As already mentioned, the number of months in the calendar is generally 12 including the Babylonian calendar with the following month names: Nīsannu, Ayyāru, Sīmannu, Du'ūzu, Ābu,

[22]Hunger, Wien, and Reiner, "A Scheme For Intercalary Months From Babilonia", h. 22.
[23]Arwin Juli Rakhmadi Butar Butar, Kalender *: Sejarah dan Makna dalam Kehidupan*, (Semarang: CV. Mulia Konsultama Business, 2014), h. 25.
[24]Stevel Jadeal, "Counting Days In Ancient Babylon: Eclipses, Omens, And Calendrics During The Old Babylonian Period (1750-1600 BCE)" (The University of North Carolina at Charlotte, 2016), h. 53.
[25]Stevel Jadeal, "Counting Days In Ancient Babylon: Eclipses, Omens, And Calendrics During The Old Babylonian Period (1750-1600 BCE)" (The University of North Carolina at Charlotte, 2016), h. 56.

Ulūlū, Tašrītu, Arahsamna, Kislīmu, Tabētu, Šyabāṭu, Addāru. For leap months, Ulūlū 2 or Addāru 2 is added to the observation results.[26]

Table 2.1

Month No.	Babylonian Month Names	The Time in the Christian Calendar
1	Nīsannu	March – April
2	Ayyāru	April – May
3	Sīmannu	May – June
4	Du'ūzu	June – July
5	Ābu	July – August
6	Ulūlū	August – September
7	Tashrit	September – October
8	Arahsamma	October – November
9	Kislīmu	November – December
10	Taboo	December – January
11	Šyabāṭu	January – February
12	Addāru	February – March
13	Ululū 2/ Addar 2	–

Based on the previous explanations, it can be seen that the Ancient Babylonian calendar applied a calendar system with the lunar cycle as its reference (*lunar* system) and a purely determined method using observation (rukyat in Muslim terms). Regarding the problem of the difference between the calendar and the solar cycle which is approximately 10-11 days in a year, the Babylonians used intercalation with the addition of one month in a certain year so that the calendar was in harmony with the seasons and the determination of the addition of one month also had its criteria as explained above but still by using observations of the movement of the moon and natural patterns so that it was irregular.

Regarding intercalation that did not have certain rules, the Babylonians in the post-ancient Babylonian era began to want certainty of intercalation in their calendar system so that it would be easy to insert leap months in their calendars. So that initially the Babylonians used a lunar system calendar with a purely observational determination which began to be applied around 1700 BC during the reign of King Hummarabi based on *the lunar*[27] system, then in the 5th century BC the Babylonians adopted the intercalation cycle of *the luni-solar* calendar systemi.e. a 19-year cycle

[26]Gian Pietro Basello, "Elam and Babylonia: The Evidence of the Calendars," Melamsu Symposia, 2002, h. 36; lihat pula pada Antonio Panaino, "Calendars," Brill Over three centuries of scholarly publishing, n.d., https://referenceworks.brillonline.com/entries/encyclopaedia-iranica-online/calendars-COM_7287, (accessed on December 06, 2023).

[27]Arwin Juli Rakhmadi Butar Butar, *Kalender: Sejarah dan Signifikansi dalam LifeCet. I (Semarang: CV. Mulia Konsultama Business, 2014), hlm. 24.*

because it is easier to predict, the switch was made so that the Babylonian calendar had clear rules about its intercalation so that it was easy to adjust the difference of *the lunar calendar* with the transition of the seasons based on the movement of the sun, so that the Babylonian calendar which was originally a *lunar* system with its observation method changed to the *Luni-Solar* calendarwith systematic intercalation.[28]

Apart from all that, one of the greatness of the ancient Babylonians in their calendar system was that they managed to divide the arrangement of one month into 4 weeks with a cycle of 7 days based on the age of the moon which is between 29 or 30 days. This is because the Babylonians found that the phases of the moon changed every seven days based on their observations, including the first quarter moon phase, then seven days after the full moon phase, the next seven days the final quarter phase and the seven days after the final moon phase (the moon disappeared). That is also the basis and reference for why there are seven days in the week, which is the heritage of the Babylonians.[29] From the consistency of the Babylonians, they made observations that the number of days in a calendar year was 354 days.[30]

Table 2.2
Babylonia Loner Manth

1	2	3	4	5	6	**7**		First Quarter
8	9	10	11	12	13	**14**		Full Moon
15	16	17	18	19	20	**21**		Last Quarter
22	23	24	25	26	27	**28**		New Moon
29	(30)							

The table explains simply the Babylonians' thinking about their seven-day cycle from the results of the observation of the moon, which is also the basis for them to determine the beginning of the month in their calendar, the 29th or 30th day being an additional day according to the time of the crescent moon appearance at the end of the month.

[28]R.H Van Gent, "The Babylonian Calendar," Utrecht University, 2021, https://webspace.science.uu.nl/~gent0113/babylon/babycal.htm, (accessed February 05, 2024).

[29]Michael Falk, "Astronomical Names for the Days of the Week", h. 122.

[30]The Editors Encyclopaedia Britannica, "Babylonian Calendar," Britannica, February 10, 2021, https://www.britannica.com/science/Babylonian-calendar, (accessed December 05, 2023).

Based on the explanations above, it can be understood that the Babylonian calendar is a calendar with basically a *lunar* system, but as it develops, the calendar system is combined with the *solar* system so that it becomes a *luni-solar system* whose number of days in a month is between 29 days or 30 days and consists of 12 months in a year. In determining the beginning of the month, the Babylonians used an observation method, namely observing the young crescent moon (hilal), if the crescent is not visible for any reason, then the number of days in the month is 30 days, if the crescent moon is visible, then the number of days is enough to number 29 days.

3. Hijri Calendar System

The Hijri calendar or also known as the Kamariah calendar is a calendar with a calculation system based on the circulation of the moon around the earth. In determining the day of this calendar, there are two methods, namely determined by astronomical calculation or determined based on the observation of the hilal (young crescent), so there may be a difference of one day if different methods are used in determining the calendar.[31]

The Hijri calendar is a calendar system that in its determination is based on the circulation of the moon around the earth, this calendar is used by Muslims. The Hijri calendar is 10 to 12 days shorter than the Christian calendar because the number of days ranges from 354 (basitah) or 355 (leap) so that the Hijri calendar always experiences a forward shift towards the Christian calendar.[32] The month as a reference in determining the beginning of the hijri month has undergone several developments in identifying it both in terms of methods and others, the factor of knowledge advancement is the main thing in the development of how to identify it, besides that differences of opinion in interpreting the texts of the Qur'an and the hadith of the Prophet are also things that present the dynamics of the development of determining the beginning of the hijri month.[33]

The most commonly used determination of the beginning of the month of Kamariah is by the rukyat method by making direct observations on the 29th when the end of the month, if the hilal has been seen, then the next day is the beginning of the month, but when the hilal is not visible then the month is rounded up to 30 days, but of course by taking into account the height of the hilal from these criteria.[34] In particular, the observation on the 29th of the end of the month has additional criteria, namely criteria about the height of the hilal and its elongation so that in the modern era

[31]Abu Sabda, *Astronomi Syar'i dan Astronomi Seri 2* (Bandung: Persis Pers, 2019), h. 25.

[32]Vanya Karunia Mulia Putri, "Kalender Hijriah: Pengertian dan Perhitungan," Kompas.com, 2022, https://www.kompas.com/skola/read/2022/09/08/090000269/kalender-hijriah--pengertian-dan-perhitungannya (accessed on August 12, 2024).

[33]Aristiono Hamdani, "Analisis Perspektif Empat Madzhab pada Matla' dalam Menentukan Awal Bulan Hijriah," AL – *AFAQ: Jurnal Astronomi dan Astronomi* 4, no. 1 (2022), h. 33.

[34]Nur Afdal Purnama Putra, Andi Muh. Akmal, Dan Halima B, " Analisis Tentang Rukyat Hilal Dalam Kitab Khulāṣah Al-Aqwāl Fī Ma'rifat Al-Waqt Wa Ru'yat Al-Hilāl Karya Ibnu Rajab Al Majdī," *Hasabuna* 3 no. 2 (2022), h. 5.

now the determination of the beginning of the month is quite complex because it is necessary to follow the guidelines that have been set

Naming in the hijri calendar has its own meaning and there are important events every month. The meaning of the name of the month on the hijri calendar is as follows:[35]

Table 3.1

Month No.	Month Name	Name Meaning
1	Muharram	A purified and venerable moon. In this month, people are not allowed to fight in this month and the other three months
2	Safar	Empty moon
3	Rabiul Awal	First Spring
4	Rabiul Akhir	Second spring
5	Jumadil Awal	First winter
6	Jumadil Akhir	Second winter
7	Rajab	Month of praise
8	Sha'ban	Distribution month
9	Ramadan	Very hot moon
10	Shawwal	Hunting moon
11	Dzul Kaidah	Rest month
12	Dzul Hijjah	Hajj month

The determination of the beginning of the month in the hijri calendar refers to the existence of the hilal, which in fact in defining it refers to several factors, namely: the moon position factor, the visibility factor (observation, visibility), and the nas factor (postulate), these three things are points that need to be considered in determining the beginning of the hijri month:[36]

a. Moon Position Factor

This criterion requires that the position of the moon is above the horizon when the sun sets, which is preceded by the occurrence of ijtimak or conjunction.

b. Visibility Factor (rukyat)

This factor is related to the third factor. Sky conditions are an important point in this factor because considering that there is an influence of the atmosphere, thick and cloudy clouds when making

[35]Lutfiana Dwi Safitri dkk., "Penggunaan Matematika dalam Kalender Hijriah," *Santika* 3 (2023), h. 501-502.
[36]Arwin Juli Rakhmadi Butar Butar, *Masalah Penentuan Awal Bulan Wacana Antara Hisab dan Rukyat* (Malang: Madani, 2014), h. 90-93.

observations or sometimes light pollution somewhere is very high so that it is difficult to get visibility of the moon.

c. Factor Nash

This factor is sourced from the hadiths of the Prophet Muhammad (saw) as the foundation of Muslims in carrying out a worship, the postulate of the Prophet (saw) is one of the factors in determining the beginning of the hijri month because the Prophet (saw) also said in his hadith related to this problem, although in its development many interpretations have emerged related to the hadith.

Regarding the issue of when the beginning of the day in the Hijri calendar actually has three views, the first at Maghrib (which is the majority view), the second at dawn (the Hanafiyah minority view), and the third at midnight (which is a new view as an alternative). Criterion 29 stipulates that the 29th is the day of ijtimak with the condition that ijtimak occurs *qobla ghurub*, it gives a signal that the start of the day for this criterion is in accordance with the view of the majority of jurisprudence scholars, namely at sunset or at the time of Maghrib. This is explained in Yasin's letter verse 40.[37]

Based on the explanations above, it can be seen that the Hijri calendar is a calendar based on *the lunar* system, which refers to the phases of the moon in its determination. The number of days in a calendar month is between 29 days or 30 days, there is no provision on the number of days in 1 month, everything depends on the results of observation (rukyat) and in other methods depends on the results of hisab. However, in other provisions, namely the hijri calendar based on hisab urfi, the provisions of the day have been determined so that there is no need for observation (rukyat) and hisab anymore because the provisions on the calendar have been determined, but in the current era the criteria for the hijri calendar based on hisab urfi have not been used. The determination of the beginning of the month is done by observing the hilal when the sun has set, if it is not seen, generally the number of days is set to 30 days, if it is visible, then the day is enough 29.

4. Similar Babylonian and Hijri Calendars

a. References and Methods for Determining the Beginning of the Month

The Babylonian calendar and the Hijri calendar based on the previous explanation are calendars that both use the moon as the main medium in determining the date, although along with the development of the Babylonian calendar became a calendar with a *lunar-solar* system because it wanted to adjust to the changes in the seasons related to the sun, and the Hijri calendar remained in *its* lunar systemBut it remains that the similarity between the two is based on the phase of the moon in determining the month and date.

[37]Elly Uzlifatul Jannah, "Kriteria Kalender Hijriah 29 dalam Astronomi dan Tinjauan Fiqh," *El-falaky* 6, no. 2 (2022), hlm. 303.

The phase of the moon that is a reference for determining a new date is both using the new moon phase, in this case the phase when the moon is in the shape of a thin crescent (hilal in Islamic terms) and the date of the end of the month is running, which is when the moon phase has entered *the new moon* phase again, this is known by observing the moon when entering the end of the current month.

The observation referred to in determining the beginning of the month is to observe the moon when it has entered the end date of the current month whether the young crescent moon has been seen or not, this is done by the Babylonians as explained in the previous discussion. This method is also carried out in determining the beginning of the Hijri month, namely by observing the young crescent moon when the end date of the month runs (usually the 29th), the observation method is known as the Rukyat method, which is observing the young crescent moon (hilal) directly either with the eyes or the help of a telescope.

b. Rules on the number of days

The number of days in a month both set a benchmark between 29 and 30 days, and there is no stipulation related to the number of days in the order which means that the number of days is irregular, so these two calendars do not have a specific number of days in each month. Although in the Hisab Urfi method the number of days of the Hijri calendar has been determined (regular), but it is only one of the models of the Hijri calendar and especially in the current era the Hisab Urfi method is not used in the Hijri calendar so that the Hijri calendar is the same as the Babylonian calendar does not have a benchmark of days that have been set so that the number of days depends on the results of observation at the end of the month.

c. The beginning of the change of day

The observation method or in the language of Muslims rukyat is a method used by the Babylonians in determining the beginning of the month and it is done at the end of every month on the current date and is done in the afternoon. Similarly, Muslims also use observation to determine the beginning of the month, although in its development the use of the hisab (calculation) method has also been applied, but observation activities are still carried out at the end of each month.

The observation is made to see the young crescent moon or in Hijri calendar terms is the hilal in the afternoon, which is when the sun sets, when it has entered the 29th and observations of the crescent moon and the crescent moon are seen, then the night has entered the night of the beginning of the month and the number of days is enough 29 only, and if it is not seen for any reason, it is rounded up to 30 days. It is used in both calendar systems, and the observation time is also done in the afternoon.

As for the existence of different methods for determining the beginning of the hijri month, for example, there are those who use the hisab method without observation, this is only a consequence of the development of science and the understanding of different postulates, but it

does not eliminate the essence of the hijri calendar which was initially carried out by the observation method and until now there are still many who use the observation method (rukyat).

d. There is a determination from the authority

Government authorities also have a role in determining the beginning of the month in the two calendar systems, the Babylonian astronomers when they have made observations the results of these observations are sent to the king by letter and after that the king discusses with other officials and then is legally determined and disseminated. Texts in the form of letters about Babylonian relics are mostly found to date from the Neo-Assyrian and Neo-Babylonian periods, which are actual examples of crescent moon sightings, such as in the Neo-Assyrian text of the Harper's Collection, ABL 894:[38]

A Neo-Assyrian text from the Harper Collection, *ABL* 894, reads:

Sîn ūm 30 atamar šāqia ša ūm 30 ina pitti išāqia kī ša ūm 2 izzaz šumma ina pān šarri bēlia maḫir ina pān ša āl Aššur šarru lidqul ḫaramima šarru bēli ūmu lūkin

I observed the moon on the thirtieth night of the moon, and it was in a high position. As for the thirtieth day, it will soon be as tall as it stands on the second day. Therefore, if it is pleasing to the king, I am my lord, may the king wait for (the messenger) from Ashur, at that time the king of Tuanku can determine the date."

Based on the following letter, it can be known that:

1) The lunar *month* is determined by the appearance of the new moon and not by a predetermined calculation.
2) An envoy came from an important city bringing news of the apparition.
3) The date was determined by the king after listening to this envoy and discussing with other experts. (officially announced).

This also applies in determining the beginning of the hijri month, government authorities take the final role in determining it, both from the ancient era decided by the caliph to the present decided by the government, simple examples in Saudi Arabia or in Egypt. Indonesia is the same when it has entered the 29th of the Hijri month, observations will be made and the results of the observations by these experts will be collected and discussed in a meeting called the Isbat session held by the authorized government authorities, at the meeting it will then be decided about the beginning of the Hijri month and then officially announced.

[38]Ben Zion Wacholder and David B. Weisberg, "Visibility Of The New Moon In Cuneiform And Rabbinic Sources," *Hebrew Union College Annual* 42 (1971), h. 230.

e. Day Cycle

The establishment of a cycle of days was also important in the calendar system, as explained in the previous discussion that the Babylonian calendar established a cycle of seven days in a week on their calendar, which later became the inspiration for the calendars of other nations afterwards. The Hijri calendar also uses a seven-day cycle in a week because it also follows changes in the phases of the moon, regardless of whether the seven-day cycle has become a general provision in the calendar system, but in fact some traditional calendars use different day cycles such as the Javanese calendar which has a five-day cycle in the market, which means that actually the day cycle in the calendar system can use a different number but the Hijri calendar is also use the seven-day cycle so that in terms of the day cycle also the Babylonian and Hijri calendars are similar in this regard.

D. Conclusion

Based on the previous explanation, it can be concluded that the Ancient Babylonian calendar is one of the rukyat-based calendar systems that quite influenced the development of the calendar system with *its lunar* calendar system. In determining the beginning of the month and its calendar cycle, they made observations of nature and the sky because at that time they preferred to observe so they did not use the calculation system in the calendar. In addition, the Hijri calendar is also the main calendar for Muslims to determine their worship times which are also based on the *lunar system*. On the same basis based on what has been discussed in the previous discussion, the similarities between the ancient Babylonian calendar and the Hijri calendar include the following:

1. The reference and method of determining the beginning of the month both use the observation method (rukyat).
2. The provision of the same number of days between 29 or 30 and the number of days in a month is irregular depending on the observation results.
3. The beginning of the change of day is when the sun sets and observations are also made in the afternoon to see the new moon as a sign of the transition of the moon.
4. The determination of the beginning of the month involves government authorities as the institution that leads a country.

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