Integration of Science and Religion: Salat Time in Astronomical Perspectives

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Abstract:
The integration between science and religion in determining prayer times is one of the efforts of astronomers to understand the Qur'an and at the same time deepen scientific knowledge. This makes Muslims aware of the importance of studying religious knowledge and general knowledge at the same time. This research is library research. By using references from previous studies, this study covers how prayer times are from an astronomical perspective. Determination of prayer times from an astronomical perspective always pays attention to the star's arguments that have been determined. The explanation of prayer times in the Qur'an and hadith needs to be redefined through the science of astronomy so that the integration between sciences can be clearly described.

Keywords: Integration, Science, Religion, Prayer Times

Introduction
Salat is one of the five pillars of Islam that Muslims are obliged to perform. Salat is an obligation for all Muslims which is commanded directly from Allah (swt) through the Prophet Muhammad, precisely when the Prophet performed Isra’ mi’raj on the 27th of Rajab in the 12th year after the prophethood (Hambali, 2011, p. 103). The obligatory prayer is the fardhu prayer which is performed five times a day. In practice, fardhu prayers must be performed at each predetermined time. That means prayer cannot be done at any time according to will, but must be based on predetermined propositions. Of course, prayer will not be valid if it is done prematurely or not on time.
The important thing that must also be understood is that the initial determination of prayer times in the time of the Prophet was different from today. In the time of the Messenger of Allah, the initial determination of prayer time was based on the daily cycle of the position of the Sun with respect to the position of objects on Earth. Whereas at present, science and technology are developing very rapidly, the initial determination of prayer times can be done using hisab (calculated) with certain criteria (Siregar, 2017).

The beginning and end of prayer times are not definitively found in either the Qur'an or hadith, they merely indicate that prayer times have a time limit. In the science of falak, the phenomena mentioned in the Qur'an and hadith are used to indicate when worship should be performed. Then, science uses this phenomenon to make a formula for prayer times (Butar-Butar, 2018, p. 38).

Ian G. Barbour categorizes the relationship between religion and science. He grouped views on the relationship between science and religion into four typologies: conflict, independence, dialogue, and integration (Barbour, 2000, pp. 7–39). In the integration typology, science can increase religious beliefs by providing scientific evidence for revelation or mystical experience (Achmad, 2021).

In the Qur'an there is no definite mention of the beginning of prayer time. The beginning of prayer time is the result of ijtihad from scholars when interpreting Qur'anic verses and hadiths related to prayer times. The interpretation of the beginning of prayer time is still limited to natural signs, for example the time of asar prayer, which is when the shadow of an object is equal to the length of the object, the time of isya when it disappears mega merah and others. That way if the weather is not favorable for observation, then prayer time will be constrained. With these problems, it is necessary to integrate science and religion to answer the problems in determining the beginning of prayer times. That way determining prayer times will be easier without depending on the weather when it is cloudy or rainy.

Methods

The research method used in this study is a library research method that is descriptive analysis. Using previous studies, the author analyzes and makes it a source of research. This research is qualitative research that emphasizes quality or the most important thing in a study.

Results

Understanding Prayer Times

Linguistically, salat comes from the verb shalla as the mufrad form of the plural shalawat, which means "to worship"; which means "to bless" when associated with the actions of God and "to worship" when associated with human actions (Glasse, 2002, p. 361) Meanwhile, according to Izzuddin, salat linguistically means prayer (Izzuddin, 2012, p. 77), as Allah says in Qs. At-Taubah (9):103

\[
\text{خُذْ مِنْ اَمْوَالِهِمْ صَدَقَةً تُطَهِّرُهُمْ وَتُزَكِّيْهِمْ بِهَا وَصَلِّ عَلَيْهِمْْۗ اِنَّ صَلٰوتَكَ سَكَنٌ لَّهُمْْۗ وَاللُّٰٰلِهَ حُلُّٰلَٰٰٰ}
\]

Means:

Take zakat from their possessions, cleanse and purify them, and pray for them. Indeed, your prayer (grows) peace of soul for them. Allah is All-Hearing, All-Knowing (Kementerian Agama RI, 2011).
Muyiddin Khazin argued, what is meant by prayer times is the five prayer times, namely dhuhr, asar, maghrib, isha’, and dawn plus the time of imsak, sunrise, and due time (Khazin, 2004, p. 57). Meanwhile, according to Slamet Hambali that what is meant by prayer time in the sense of this is the beginning of the entry of prayer time (Hambali, 2012, p. 32).

Basic Determination of Prayer Times

Allah Almighty does not explain in detail the times of fardlu prayers and their provisions. The Qur’an is limited to hinting, while a more detailed explanation of prayer times can be found in the hadiths of the Prophet (peace be upon him) (Kementerian Agama RI Direktorat Jendral Pembinaan Kelembagaan Agama Islam, 1994, p. 1).

Q.S. Huud ayat 114

وَاَقِمِ الصَّلٰوةَ طَرَفَيِ النَّهَارِ وَزُلَفًا مِنَ الَّيْلِ ْۗاِنَّ الْحَسَنٰتِ يُذْهِبْنَ السَّيِّئَاتِ ْۗ ذٰلِكَ ذِكْرٰی لِلذَّاكِرِیْنَ

Means:
And pray at both ends of the day (morning and evening) and the beginning of the evening. Those good works erase mistakes. That is a warning to those who always remember (God) (Kementerian Agama RI, 2011).

Q.S Al-Baqarah 2:43:

وَاَقِیْمُوا الصَّلُّوةَ وَاٰتُوا الزَّکَّوَةَ وَارْكَعُوْا مَعَ الرَّاكِعِیْنَ

Means:
And perform prayers, pay zakat, and bow with those who bow (Kementerian Agama RI, 2011).

Q.S. 20:130

فَاصْبِرْ عَلٰی مَا يَقُوْلُوْنَ وَسَبِحْ بِحَمْدِ رَبِّكَ قَبْلَ طُلُوْعِ الشَّمْسِ وَقَبْلَ غُرُوْبِهَا ۚوَمِنْ اٰنَآئِ ا لَّيْلِ فَسَبِحْ وَاطْرَافَ النَّهَارِ لَعَلَّكَ تَرْضٰی

Means:
So be patient with what they say, and pray by praising your Lord, before sunrise, and before sunset; and pray (also) at midnight and the end of the day, that you may be at peace (Kementerian Agama RI, 2011).

Legal basis of the hadith

عن عبد الله بن عمرو رضي الله عنهما: أن نبي الله صلى الله عليه وسلم قال: وقت الظهر إذا زالت الشمس وكان ظل الرجل كطوله ما لم يحمر العمل، وقت الظهر ما لم تصرف الشمس ووقت صلاته المغرب ما لم تلبث الشمس قبلا عند النصف الليل الأوسط ووقت صلاته الصبح من طول على الفجر ما لم تطلش الشمس (رواه مسلم).

It means: “From Abdullah bin Amr, the Prophet (peace be upon him) said: The time of Zhuhur when the Sun slips to the shadow of a person is equal to his height, that is, as long as the time of Asr has not come. Asar time during the Sun has not turned yellow. Maghreb’s time during the Red Mega has not disappeared. Isha time until midnight. Shubuh time begins to rise at dawn as long as the Sun has not yet risen.” (HR. Muslim: 612) (Al-Asqalani, 2014, p. 39).

Prayer Times: Religious Perspectives

Based on the postulates mentioned above, scholars agree that prayer times are five times with the following details:
a. The time of prayer begins from the time the Sun slips westward until the shadow of the object is equal to the length of the object.

b. The time of the Asar prayer begins from the shadow of the object and is the same as the object until the Sun begins to set.

c. Maghrib prayer time starts from sunset until the disappearance of mega red.

d. Isya prayer time starts from the disappearance of the red mega until one-third of the night.

e. Fajr prayer time from dawn to sunrise.

Science Perspective Prayer Time

The beginning of the prayer time depends on the position of the Sun, so the prayer time can be calculated based on the angle of the Sun’s time. Based on the foundations found in the Qur’an and hadith, the timing of prayers depends largely on natural phenomena. In this regard Al-Juzairi as quoted by Maskufa (Maskufa, 2013, p. 5) Mentions that there are five ways to find out the five prayer times, namely:

a. Based on information from trusted Falak experts and determined based on calculations or shahih hisab.

b. The slipping of the Sun, the shadow that occurs after the zawal as a sign of the entry of the time of dhuhr then asar.

c. The setting of the Sun as a sign of the entry of maghrib time.

d. The disappearance of the red intercession as a sign of the entry of the time of Isha.

e. Whites that appear on the horizon as a sign of the entry of dawn time.

By knowing the position of the Sun at the times specified for prayer, of course, Falak experts will easily determine prayer times without having to make observations that depend on nature. Nature sometimes changes according to the weather making it difficult for us to determine prayer times.

Religious Unity and Science on Salat Time

With the characteristics of the position of the Sun that have been described above, it can be obtained how to determine prayer times based on the Sun in horizon coordinates, especially altitude or zenith distance. Data used by Falak practitioners include:

a. Latitude is the distance along the meridian of the earth measured from the equator to a place in question. The latitude of the place is at least 0° and a maximum of 90°. Places that are in the northern hemisphere have negative latitude values, and those in the eastern hemisphere have positive latitude values. This latitude in English is usually referred to as latitude and in Arabic it is termed ‘urdul balad. The latitude of the place is marked with the Greek letter phi (Φ) (Khazin, 2005, p. 4).

b. Longitude of a place is the angular distance measured parallel to the Earth’s equator calculated from the longitude through the city of Greenwich to the longitude through a place/country in question. The longitude of this place in English is usually termed longitude and in Arabic, it is termed thul al-balad. The astronomical sign is lambda (λ).

c. The declination of the Sun or mail shams is the distance along the circle of declination calculated from the equator to the Sun. In astronomy, it is denoted by delta (δ). (Khazin, 2005).
d. **Equation of Time** is the difference between the time of the ultimate culmination of the Sun and the meantime of the Sun. This data is usually expressed with a lowercase 'e' and is needed to calculate the beginning of prayer time (Azhari, 2012, p. 50).

e. The height of a place is the distance along a vertical line from a point equivalent to sea level to that place, expressed in meters. Altitude is used to determine the magnitude of the low horizon. The altitude of a place can be obtained from the geographical data of that place or it can also be tracked using GPS.

f. The height of the Sun referred to here is the height of the position of the Sun visible (the position of the *Sun mar'ī*, not the true Sun), at the beginning or end of prayer time measured from the horizon. The height of the Sun is usually marked "h" (lowercase) as an abbreviation of high which means altitude.

g. **Meridian Pass** is the time when the Sun is exactly at the upper culmination or celestial meridian according to the middle time, which if shown the essential time at that time is exactly \( \text{pk} \). Noon. The meridian pass can be calculated by the formula: \[ \text{Mer. Pass} = 12 - e. \]

h. Interpolation is a way of retrieving a value that exists between two data (Khazin, 2005)

i. Ikhtiyat is a precautionary step by adding or subtracting time so that the prayer schedule does not precede the beginning of time or exceed the actual end of time (Azhari, 2011, p. 73).

**Determination of the beginning of prayer times:**

a. Early Maghrib time

Maghrib time is as long as the red mega has not disappeared or sunset time. The Sun is said to set when according to the eye view of the upper disk of the Sun it intersects with the horizon. In other words, the Sun sets when the disk of the Sun is entirely under the *faq*. The formula used to determine the beginning of maghrib time is \( 12 - e + t/15 + \text{kwd} + i \) (Sado, 2015).

b. The beginning of Isha's time

The beginning of Isha's time is when the red mega has set until mid-midnight. In astronomy, mega-red is called particle bias. According to Khazin once the Sun sets on the western horizon, the surface of the earth does not automatically darken immediately. This happens because there are particles in space that refract sunlight, so even though sunlight has not hit the Earth there is still light refraction from those particles. In science, it is known as "Twilight Light" or "Twilight". According to Maskufa as quoted by Arino the height of the Sun at the time of twilight has reached 18 degrees below the horizon (-18º).

As the Sun sets, the reddish-yellow twilight light gradually becomes blackish-red because the Sun is getting downward, so the particle bias is reduced. When the position of the Sun is between 0º and -6º below the horizon, objects in the open field still see the boundaries of their shape, and at that time only some of the brightest stars can be seen. Such a state in astronomy is known as the Civil Twilight (Khazin, 2005).

Because at the position of the Sun -18º below the horizon the night is dark because it has lost the particle refraction (mega red), it is determined that the beginning of the time is if the height of the Sun is -18º. Therefore \( \text{his} = -18^\circ \). The
formula used to determine the beginning of maghrib time is \( 12 - e + t/15 + kwd + i \) (Sado, 2015).

c. Early dawn time

The beginning of Fajr prayer time is understood from dawn until the time of sunrise. The dawn of shade in science is understood as the beginning of astronomical twilight (the dawn of astronomy), this light begins to appear on the eastern horizon before sunrise of the Sun when the Sun is at a position of about \( 18^\circ \) below the horizon or the distance of the Sun's zenith is \( 108^\circ \). Another opinion says that the rising of the dawn of sādiq begins when the position of the Sun is \( 20^\circ \) degrees below the horizon or the zenith distance of the Sun is \( 110^\circ \). The formula used to calculate the beginning of shubuh time is \( 12 - e - t/15 + kwd + I \) (Sado, 2015).

There are several opinions about the height of the Sun at dawn, namely as in the following table:

<table>
<thead>
<tr>
<th>Organization</th>
<th>Zenit Distance of the Dawn Sun</th>
<th>Isya Sun Zenit Distance</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Islamic Science Karachi</td>
<td>18°</td>
<td>18°</td>
<td>Pakistan, Bangladesh, India, Afghanistan, and sebagian Eropa</td>
</tr>
<tr>
<td>Islamic Society of North America</td>
<td>15°</td>
<td>15°</td>
<td>Canada and parts of America</td>
</tr>
<tr>
<td>Muslim World League</td>
<td>18°</td>
<td>17°</td>
<td>Eropa, Timur Tengah and parts of America Serikat Semenanjung Arabia</td>
</tr>
<tr>
<td>Ummul Qura Commite</td>
<td>19°</td>
<td>90 minutes after Maghrib (120 minutes Ramadan special)</td>
<td>Semenanjung Arabia</td>
</tr>
<tr>
<td>Egyptian General Authority of Survey Syekh Taher Jalaluddin</td>
<td>19.5°</td>
<td>17.5°</td>
<td>Afrika, Syria, Irak, Lebanon, Malaysia Indonesia</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

d. The beginning of Suhur time
The time of dhuhur is when the Sun slips until the shadow of the Sun is the same length. Astronomically, the slipping of the Sun at the time of the Zuhr can be said that the Sun is culminating upward, that is, when the Sun leaves the meridian. The exact science is when the center point of the Sun moves from the meridian, or when the shadow of the object is inclined to the east and the resulting angle with the tidal line (east-west line) is no longer 90°.
e. The beginning of the market time

The target time during which the Sun has not turned yellow begins when the length of the shadow of an object is the same view. In early astronomy, prayer time was expressed as the state of the height of the Sun equal to the zenith distance of the center point of the Sun at the time of culmination plus the number one. Based on the hadith above the beginning of the time of asr prayer is when the shadow of an object is the same length as the object, then this can be achieved astronomically by determining the height of the Sun at the time of the asar (h) and determining the angle of time of the Sun (t) (Sado, 2015).

**Conclusion**

The integration between science and religion is crucial in the development of science and worship. In determining prayer times, the knowledge used continues to develop according to the times. Of course, the knowledge developed must be by the predetermined star’s postulates. The integration of prayer times between religious perspectives and science is one of the proofs that the dichotomy of science is not in line with the development of science itself.

**References**


